SCOTT®

Instruction Manual

7200 Plus

Two Channel Controller

WARNING

READ AND FOLLOW THE ENTIRE CONTENT OF THIS MANUAL PRIOR TO USE. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH.

P/N 087-0039 Rev. E 08/09

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P/N 087-0039 Rev E / Aug, 09

Table of Contents

P/N 087-0039 Rev E / Aug, 09

List of Figures

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List of Tables

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1. Safety and General Information

WARNING

ALL INDIVIDUALS WHO HAVE OR WILL HAVE RESPONSIBILITY FOR USING OR TESTING THIS PRODUCT MUST READ AND UNDERSTAND THE CONTENTS OF THIS MANUAL. THE PRODUCT WILL PERFORM AS DESIGNED ONLY IF USED AND TESTED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. FAILURE TO FOLLOW MANUFACTURER'S INSTRUCTIONS WILL RENDER THE WARRANTY AND APPROVALS NULL AND VOID. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY ALSO RESULT IN SERIOUS INJURY OR DEATH.

1.1. Important Notices

Scott Health and Safety can take no responsibility for use of its equipment if it is not used in accordance with the instructions. If further operational or maintenance details are required but not provided in this manual, contact Scott Health and Safety or their agent. Scott Health and Safety shall not be liable for any incidental or consequential damages in connection with any modifications, errors or omissions in this manual. While every effort has been made to ensure accuracy in this owner's manual, no responsibility can be accepted for errors or omissions. Additionally, industry standards, codes, and legislation are subject to change. This publication is not intended to form the basis of a contract, and the company reserves the right to amend the design, content, and specifications of the detector without notice.

1.2. Certifications and Approvals

UL1604	CSA File # 236219	CSA C22.2 No 0.4	CSA C22.2 No 0
UL 913	CSA C22.2 No 1010.1	CSA C22.2 No 25	
UL1203	CSA C22.2 No 213	CSA C22.2 No 30	
	CSA C22.2 No 157	CSA C22.2 No 142	ISA S12.B

The 7200 Plus enclosure is rated for Class I, Division 2, Groups A,B,C and D or non-hazardous locations only.

P/N 087-0039 Rev E / Aug, 09

1.3. Warnings, Cautions, and Notes

Throughout this document, warnings, cautions, and notes have been interspersed to draw attention to potentially unsafe, hazardous, or unique situations that require user attention. Each warning, caution, or note is labeled and quickly identified using an icon.

WARNING - INDICATES A POTENTIALLY HAZARDOUS SITUATION, WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

CAUTION - INDICATES A POTENTIALLY HAZARDOUS SITUATION, WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE INJURY. IT MAY ALSO BE USED TO ALERT AGAINST UNSAFE PRACTICES.

NOTE - HIGHLIGHTS VARIOUS INSTANCES WHERE AN ATTENTION TO DETAIL IS CRITICAL TO PRODUCT PERFORMANCE.

1.3.1. General Warnings and Cautions

The following list of warnings and cautions pertain to the general use and care of the 7200 Plus.

Failure to follow these warnings and cautions may result in death, injury, or poor equipment performance.

WARNINGS

EQUIPMENT NOT USED AS PRESCRIBED WITHIN THIS MANUAL MAY IMPAIR OVERALL SAFETY.

EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITIBILITY FOR CLASS 1, DIVISION 2.

EXPLOSION HAZARD – DO NOT REPLACE FUSE UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE HAZARD FREE.

EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE HAZARD FREE.

USE A PROPERLY RATED CERTIFIED AC POWER (MAINS) CABLE INSTALLED AS PER LOCAL OR NATIONAL CODES.

FOR DC POWERED UNITS, DC POWER MUST BE FROM A SELV RATED SOURCE.

A CERTIFIED AC POWER (MAINS) DISCONNECT OR CIRCUIT BREAKER SHOULD BE MOUNTED NEAR THE CONTROLLER AND INSTALLED FOLLOWING APPLICABLE LOCAL AND NATIONAL CODES. IF A SWITCH IS USED INSTEAD OF A CIRCUIT BREAKER, A PROPERLY RATED CERTIFIED FUSE OR CURRENT LIMITER IS REQUIRED TO BE INSTALLED AS PER LOCAL OR NATIONAL CODES. MARKINGS FOR POSITIONS OF THE SWITCH OR BREAKER SHOULD STATE (I) FOR ON AND (O) FOR OFF.

CAUTIONS

CLEAN USING ONLY A DAMP CLOTH WITH NO SOLVENTS.

DO NOT USE HAND CLEANERS, LOTIONS, SOAPS, OR ANY CLEANING PRODUCTS CONTAINING SILICONE PRIOR TO OR WHILE HANDLING CATALYTIC BEAD SENSORS, FAILURE TO DO SO MAY POISON SENSORS.

1.4. General Rules of Use

POWER MUST BE ON TO WORK. The 7200 Plus Controller will only operate while powered on.

SHOCK HAZARD! Disconnect or turn off power before servicing this instrument. NEMA 4X wall mount models should be fitted with a locking mechanism after installation to prevent access to high voltages by unauthorized personnel.

LIMIT OF CERTIFICATION. Only the combustible monitor portions of this instrument have been assessed by CSA for 122.2 No. 152 performance requirements. This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.

P/N 087-0039 Rev E / Aug, 09

1.5. Warranty

Scott Health & Safety (SCOTT), a division of Tyco International warrants it's 7200 Plus Controller PRODUCTS (THE PRODUCTS) to be free from defects in workmanship and materials for a period twelve (12) months from the date of original manufacture by SCOTT. This warranty applies to all components of THE PRODUCTS.

SCOTT's obligation under this warranty is limited to replacing or repairing (at SCOTT's option) THE PRODUCTS shown to be defective in either workmanship or materials.

To maintain the warranty THE PRODUCT must be installed and maintained in accordance with the operating and maintenance instructions include with THE PRODUCT.

Only personnel of SCOTT or, when directed by SCOTT, authorized SCOTT agents, are permitted to perform warranty obligations. This warranty does not apply to defects or damage caused by any repairs of or alterations to THE PRODUCTS made by owner or any third party unless expressly permitted by SCOTT product manuals or by written authorization from SCOTT.

To obtain performance under this warranty, and as a condition precedent to any duty of SCOTT, the purchaser must return such products to SCOTT, a SCOTT authorized agents or a SCOTT authorized service center. Any product returned to SCOTT shall be sent to "SCOTT HEALTH & SAFETY" (Attn: Warranty Claim Dept.), 4320 Goldmine Road, Monroe, NC 28111.

This warranty does not apply to any malfunction of or damage to THE PRODUCTS resulting from accident, alteration, misuse, or abuse.

THIS WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN ADDITION, SCOTT EXPRESSLY DISCLAIMS ANY LIABILITY FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES IN ANY WAY CONNECTED WITH THE SALE OR USE OF SCOTT PRODUCTS, AND NO OTHER FIRM OR PERSON IS AUTHORIZED TO ASSUME ANY SUCH LIABILITY.

1.5.1. Contacting Scott Health & Safety

To contact Scott Health & Safety, call, fax, email or write to:

Scott Health & Safety

4320 Goldmine Road

Monroe, NC 28110

Website: www.scotthealthsafety.com

Phone: 800.247.7257 FAX 704.291.8330

1.6. Acronyms Quick Reference

Throughout the duration of this manual, several acronyms are used. Provided in Table 1-1 is a quick reference chart to quickly identify any acronym that may be unfamiliar to users.

Table 1-1. Acronym Quick Reference List

Acronym	Definition	Acronym	Definition
AC	Alternating Current	mA	Milliamps
A/D	Analog to Digital	mm	Millimeters
ADC	Analog to Digital Convertor	MOV	Metal Oxide Varistor
ASCII	American Standard Code for Information Interchange	N/A	Not Applicable
C	Common or the pole	NC	Normally Closed (Relay Contact)
°C	Degrees Celsius	NEC	National Electrical Code
CH_4	Methane	NEMA	National Electrical Manufacturers Association
CO	Carbon Monoxide	NIST	National Institute of Standards and Technology
CPU	Central Processing Unit	NO	Normally Open (Relay Contact)
CSA	Canadian Standards Association	O_2	Oxygen
D/A	Digital to Analog	PC	Personal Computer
DAC	Digital to Analog Convertor	PCB	Printed Circuit Board
dB	Decibels	PLC	Programmable Logic Controller
DC	Direct Current	ppm	Parts per Million
DCS	Digital Control System	R	Resistance
°F	Degrees Fahrenheit	RFI	Radio Frequency Interference
GND	Ground	R.H.	Relative Humidity
H_2S	Hydrogen Sulfide	RTU	Remote Telemetry Unit
Hz	Hertz	RTV	Room Temperature Vulcanization (elastomer sealant)
I	Current	SELV	Safety Extra Low Voltage
IEEE	Institute of Electronic & Electrical Engineers	TCP/IP	Transmission Control Protocol/Internet Protocol
I/O	Input/Output	VAC	Volts Alternating Current
LCD	Liquid Crystal Display	VDC	Volts Direct Current
LED	Light Emitting Diode	Vpk	Peak Voltage
LEL	Lower Explosive Limit		

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2. Introduction

The Scott Health & Safety 7200 Plus Two Channel Controller is designed to display, and control alarm event switching for up to two sensor points. Inputs are typically a 4-20mA signal from a transmitter, or signals from sensors directly. The 7200 Plus is equipped with three alarm levels per channel with features such as ON / OFF delays, latching relays, and alarm Acknowledge. A dedicated horn driver circuit for a local audible alerts is also standard.

Two standard 5-amp alarm relays are configurable via the Alarm Voting menu to make relays trip based upon various alarm combinations. Real-Time Clock and Calendar are also standard. Options such as 4-20mA outputs, discrete relays for each alarm and audible alerts can be added. RS-485 (MODBUS RTU) or Ethernet (MODBUS TCP) ports are also available for sending data to PC's, PLC's, DCS's, or other Scott Health & Safety controllers.

A 128 x 64 pixel graphic LCD readout displays monitored data as bar graphs, 30-minute trends and engineering units. System configuration is accomplished using displayed menus and the keypad. All configuration data is retained in non-volatile memory during power interruptions.

The five button symbols below the display are magnetically activated using the supplied magnetic wand without opening the enclosure. Opening the enclosure door provides access to the touch keypad. Refer to Figure 2-1 and Figure 2-4.

2.1. Physical Components

Refer to Figure 2-1.

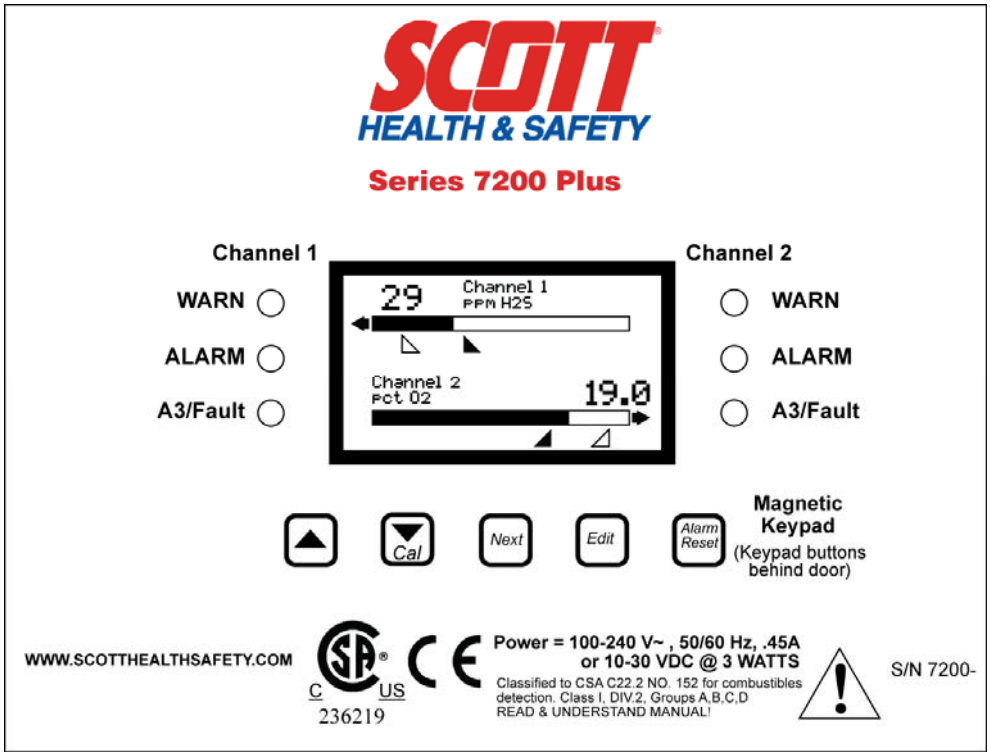


Figure 2-1. External Display

P/N 087-0039 Rev E / Aug, 09

2.1.1. Motherboard

The 7200 Plus Motherboard is the interface between the Display / CPU assembly and all other system I/O devices. Six terminals located at the bottom of the motherboard provide connections for input power, output power, and connection to optional devices. A Universal Switching Power Supply located at the top middle of the motherboard regulates AC input power for distribution to DC components.

Refer to Figure 2-2.

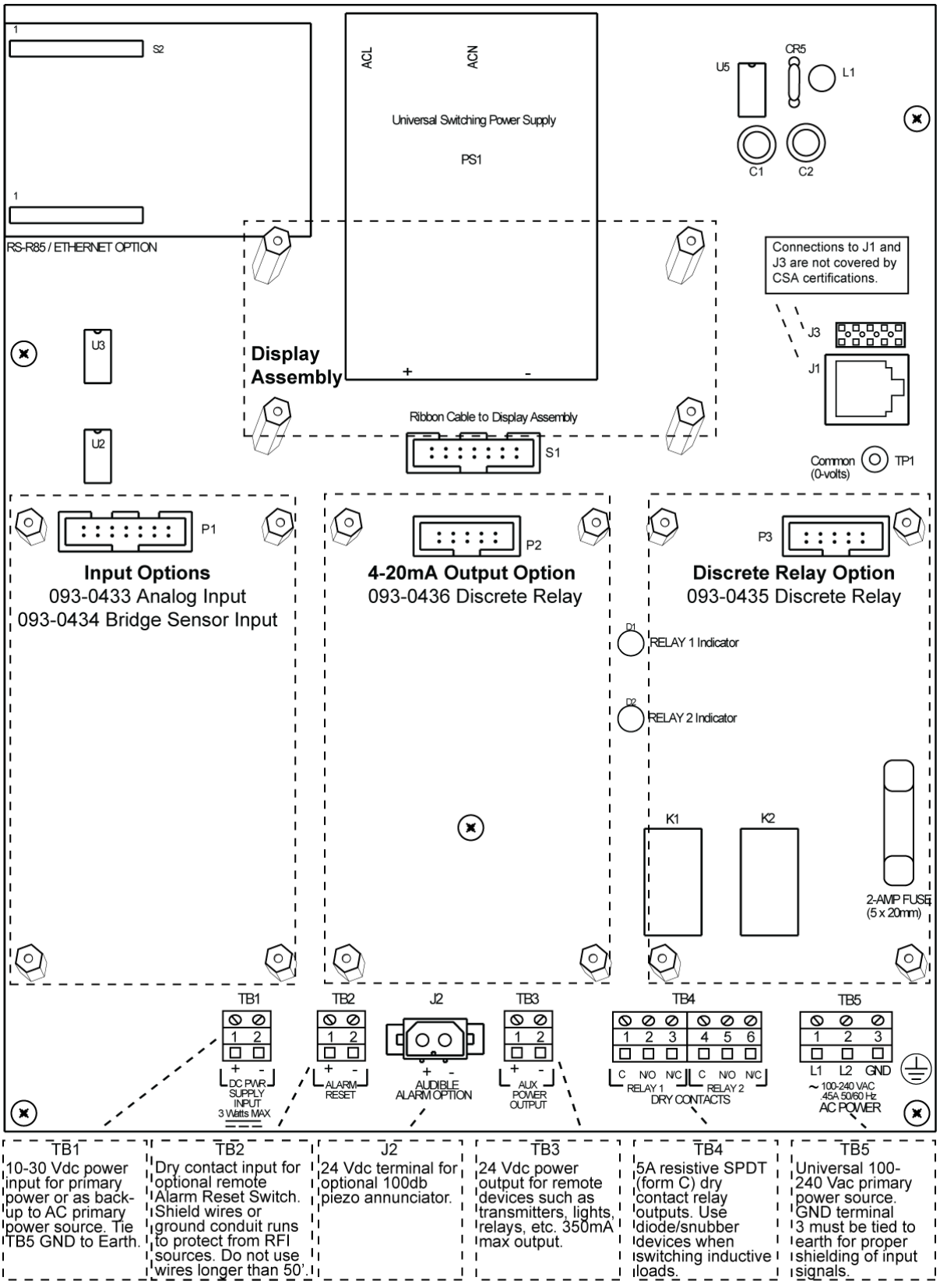


Figure 2-2. Motherboard

- **TB1** - Terminals for DC power input. DC power must be 10-30V DC, max 3 Watts. When connected without an AC power source at TB5, the DC power input is the primary power source for the 7400 plus. When connected with an AC power source, DC power inputted at TB1 is a backup in the event AC power input is lost.

CAUTION

REGARDLESS OF AN AC POWER INPUT AT TB5, POWER TO THE 7400 PLUS MUST BE GROUNDED TO EARTH USING TERMINAL 3 OF TB5. FAILURE TO DO SO COULD CAUSE COMPONENT DAMAGE.

- **TB2** - Terminals for a remote alarm reset switch. If enabled in the menu options, Relay 2 may be acknowledged and reset using a remote alarm reset switch. Relay 1 will always remain unaffected to ensure an indication of an alarm remains.
- **J2** - 24VDC output for the optional 100db piezo annunciator.
- **TB3** - 24 VDC universal output power supply with up to 350mA available to power optional remote devices such as alarms, horns, lights, relays, etc. 24VDC is only available when AC power is applied at TB5 to the 7200 Plus. Refer to Figure 2-3 for distribution of AC and DC power.

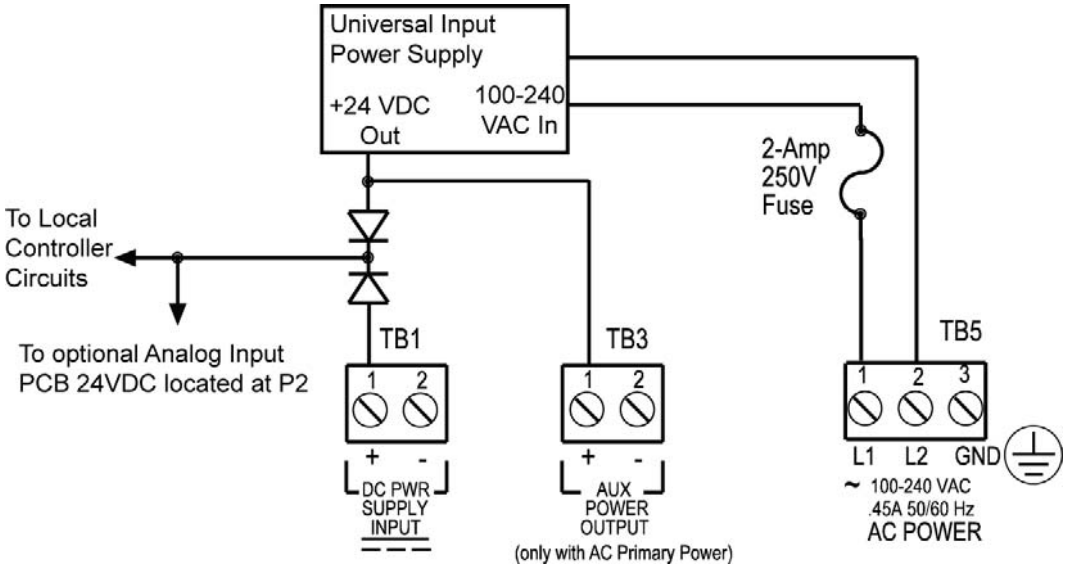


Figure 2-3. Power Distribution

- **TB4** - Output connections for standard relays K1 and K2. Each relay is 5A resistive SPDT (form C) dry contact.

CAUTION

RELAYS ARE RATED FOR RESISTIVE LOADS. INDUCTIVE LOADS, SUCH AS CONTACTOR COILS OR MOTORS MAY CAUSE CONTACT ARCING, WHICH EMITS RFI INTO THE SENSOR SIGNALS. USE APPROPRIATE SNUBBERS AND MOV'S ACROSS INDUCTIVE LOADS AND KEEP WIRING AWAY FROM SIGNAL WIRES. FAILURE TO DO SO COULD RESULT IN RFI AND NEGATIVELY EFFECT EQUIPMENT PERFORMANCE.

- **TB5** - Terminals for AC power input. AC power must be 100-240VAC, 0.45A, 50/60Hz. Terminal 3 must be grounded to earth.

The Display / CPU assembly attaches to the motherboard with 4-standoffs and connects via ribbon cable to S1. Input options that may be installed into the Input Option P1 connector located on the lower left side of the motherboard are an Analog Input PCB or a Bridge Sensor Input PCB. The P2 connector may have an optional 4-20mA Output PCB. The P3 connector may have an optional Discrete Relay PCB. Another optional device that may be connected to the motherboard is MODBUS RTU RS-485 interface.

2.1.2. Internal Display Assembly

Removing the enclosure door provides access to the Internal Display Assembly.

Refer to Figure 2-4.

Arrows below the bars indicate alarm trip point values, making it easy to identify channels at or near alarm. The direction the horizontal 45 degree arrow side points indicates either a HIGH (as shown on Channel 1) or LOW (as shown on Channel 2) trip. Left and Right hand arrows located at the ends of each bar graph point towards Channel Alarm LED's on the front panel.

SW1-SW5 can be pressed to activate the switches instead of using the magnetic wand when the Internal Display Assembly is accessible.

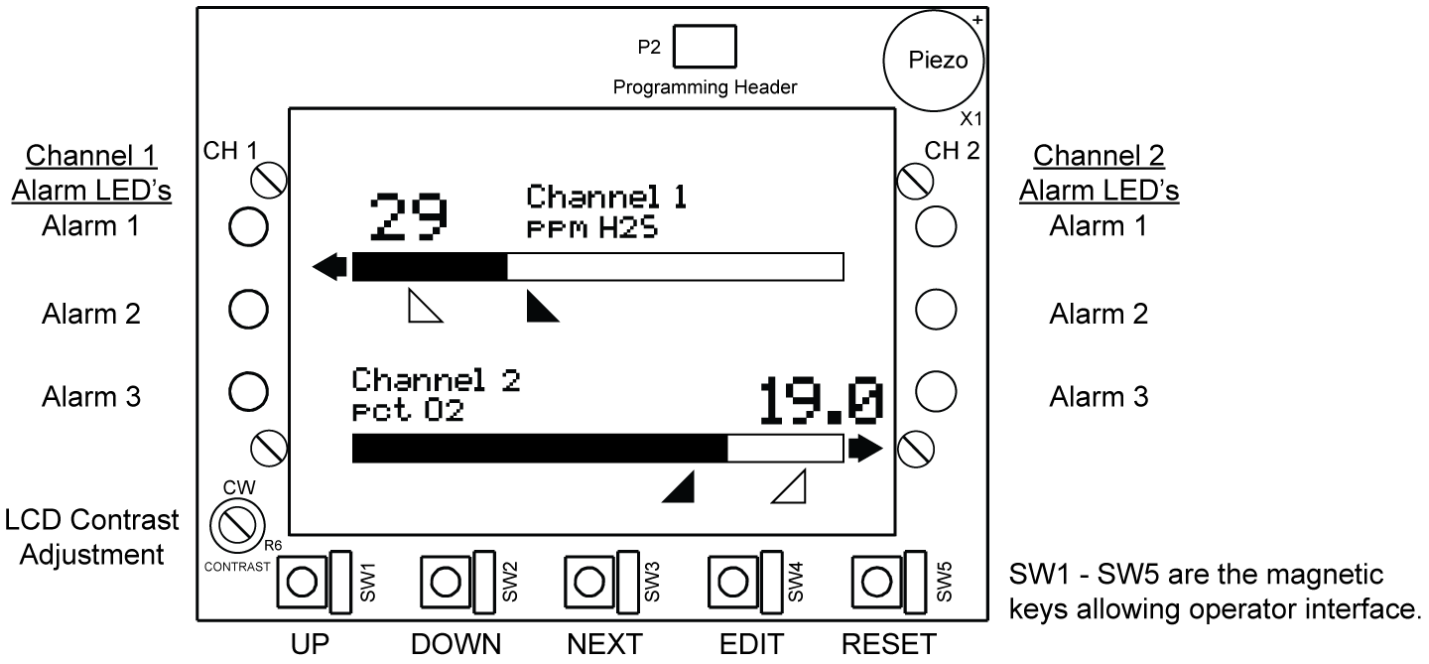


Figure 2-4. Internal Display Assembly

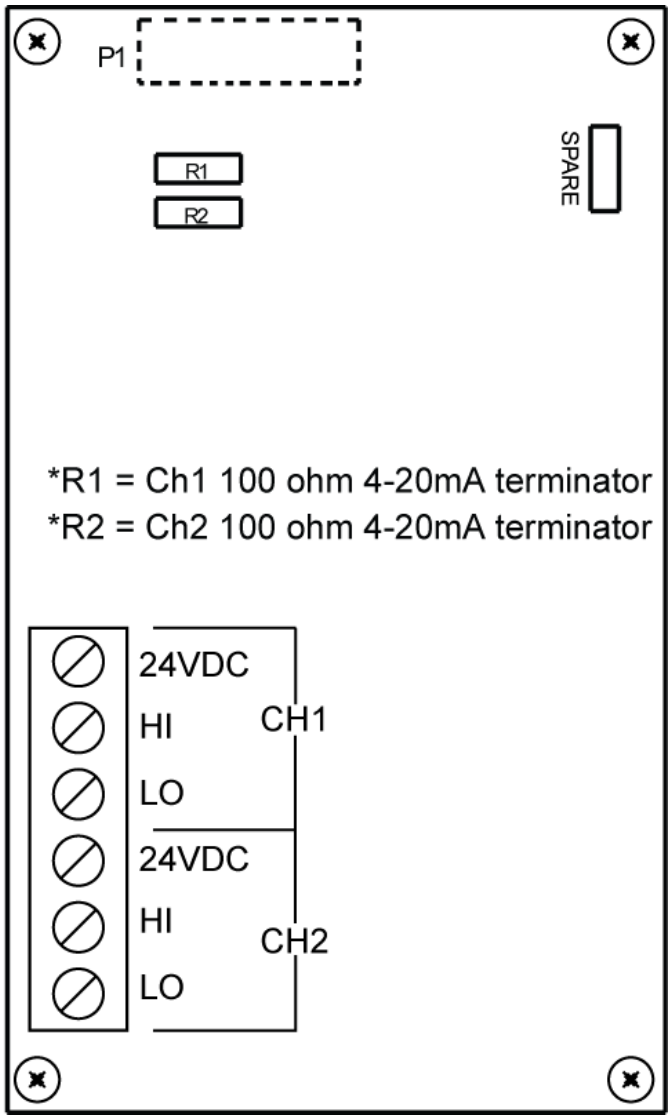
P/N 087-0039 Rev E / Aug, 09

2.1.3. Input Options

2.1.3.1. Analog Input Option

The Analog Input PCB (P/N 093-0433) option may be installed at P1 on the Motherboard.

Refer to Figure 2-5.



Refer to Figure 2-6 for transmitter wiring diagrams.

Figure 2-5. Analog Input PCB

The Analog Input Option allows interfacing 7200 Plus to field transmitters with 4-20mA. Terminals for CH1 and CH2 provide Channel 1 & Channel 2 HI/LOW terminals for receiving analog inputs and provide a 24 VDC excitation for powering external transmitters. R1 / R2 are 100 ohm precision socketed termination resistors between each channel's signal + and - 4-20mA input terminals.

Figure 2-6 displays typical wiring for both 2-wire and 3-wire transmitters. Refer to the specific transmitter's User Manual for detailed wiring configurations.

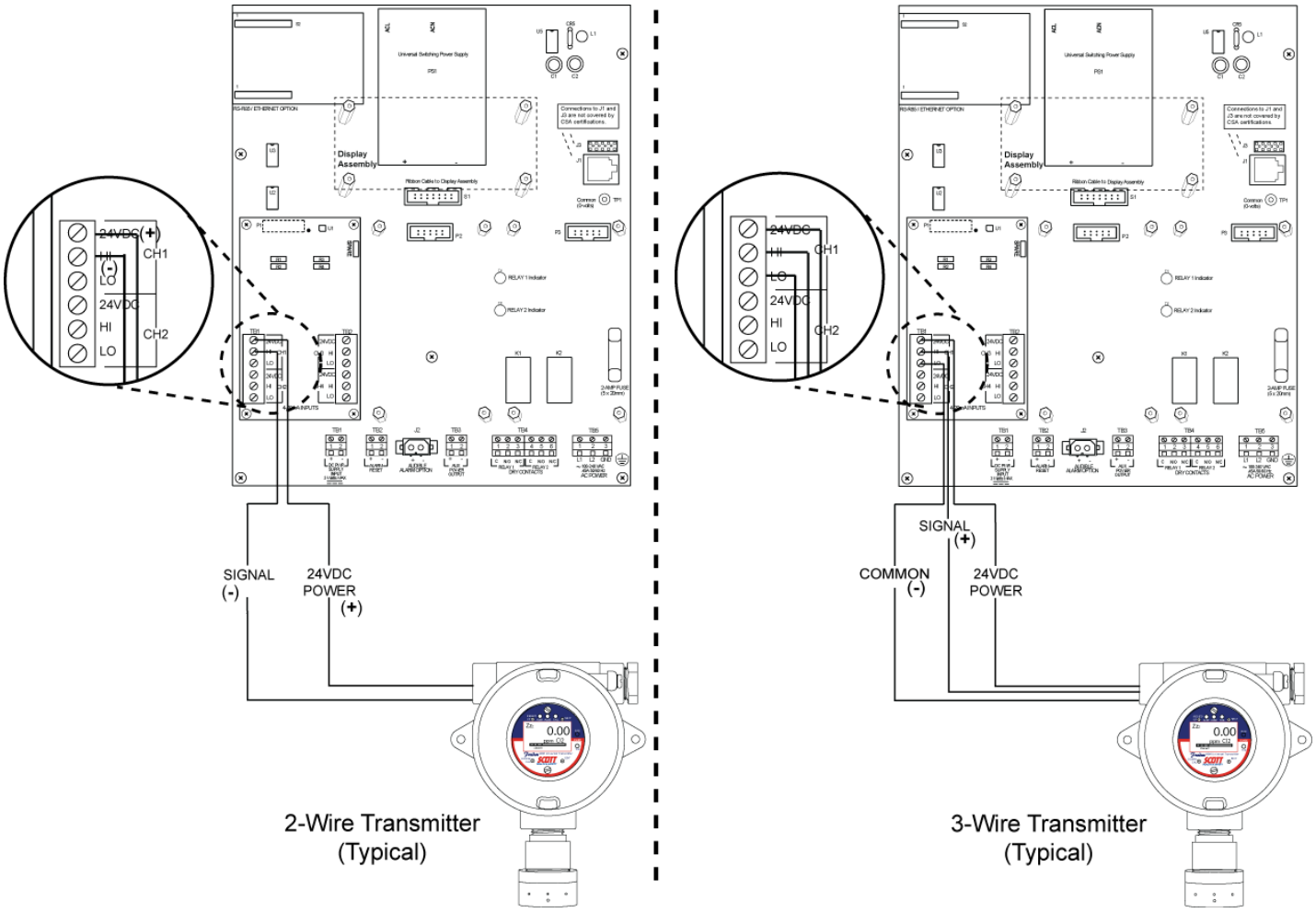
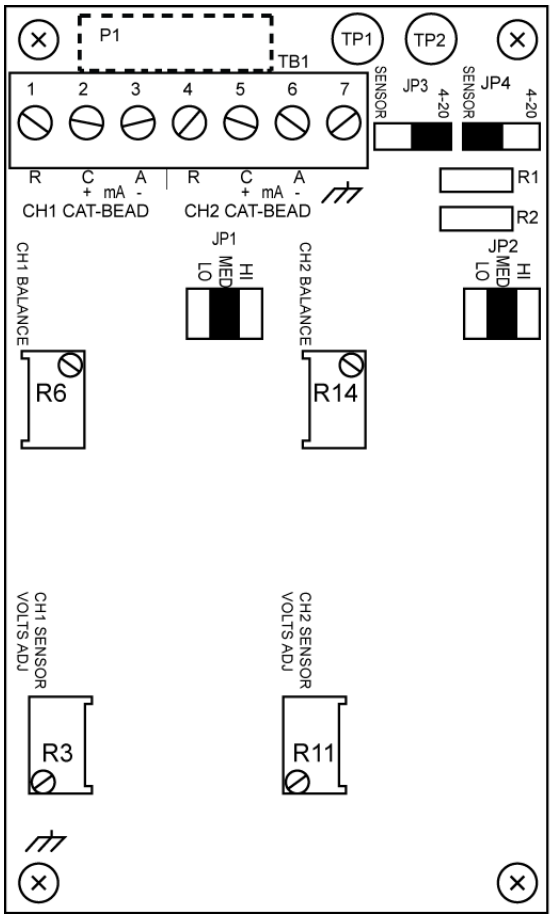


Figure 2-6. External Transmitter Wiring

2.1.3.2. Cat Bead Sensor Input Option

The Cat Bead Sensor Input PCB (P/N 093-0434) option may be installed at P1 on the Motherboard. Refer to Figure 2-7.



Jumpers - JP3 (Ch1) and JP4 (Ch2) must be placed in the position of the the cat bead source, either Sensor or Transmitter.

4-20 mA 100 ohm Terminating Resistors - R1 (Ch1) or R2 (Ch2) must be installed only when a transmitter is the input source

Jumpers - JP1 (Ch1) and JP2 (Ch2) are Course Gain Jumpers that are set for the gain of the Bridge Amplifier.

R6/R14 - R6 (Ch1) and R14 (Ch2) are the Sensor Balance Voltage Adjustment Pots and must be set to 0.4V with Zero gas applied to a sensor

R3/R11 - R3 (Ch1) and R11 (Ch2) are the Sensor Balance Voltage Adjustment Pots and must be set to proper voltage between the R & A terminals

Refer to Figures 2-8 and 2-9 for transmitter wiring diagrams.

Refer to Paragraph 3.6 for Cat-Bead Sensor Initial Set-up.

Figure 2-7. Catalytic Bead Sensor Input PCB

The Cat Bead Sensor Input PCB allows cat bead sensors to be connected directly to the 7200 Plus without additional signal conditioning or transmitters. Each channel is equipped with a bridge amplifier, balance potentiometer, and an adjustable switching regulator for setting the correct sensor excitation voltage. A 3-position coarse gain jumper allows setting the gain of the bridge amplifier. Fault supervision circuitry forces the 7200 Plus into a FAULT condition upon sensor failure or removal.

This option may also be configured to accept 4-20mA inputs for mixing a cat-bead sensor and a 4-20 mA current loop into the same board. Placing either channel's 2-position SENSOR/4-20mA jumper (JP3 or JP4) into the 4-20mA position and installing the associated precision 100 ohm socketed resistor, allows 4-20mA signals to be applied to the mA+ / mA- terminals. Precision 100 ohm resistors are taped to the inside of the 7200 Plus enclosure.

NOTE

WHEN INSTALLING A CAT BEAD SENSOR, A ONE TIME ONLY INITIAL SETUP IS REQUIRED. REFER TO PARAGRAPH 3.6 FOR MORE INFORMATION.

2.1.3.2.1. Cat Bead Sensor Input Wiring Diagrams

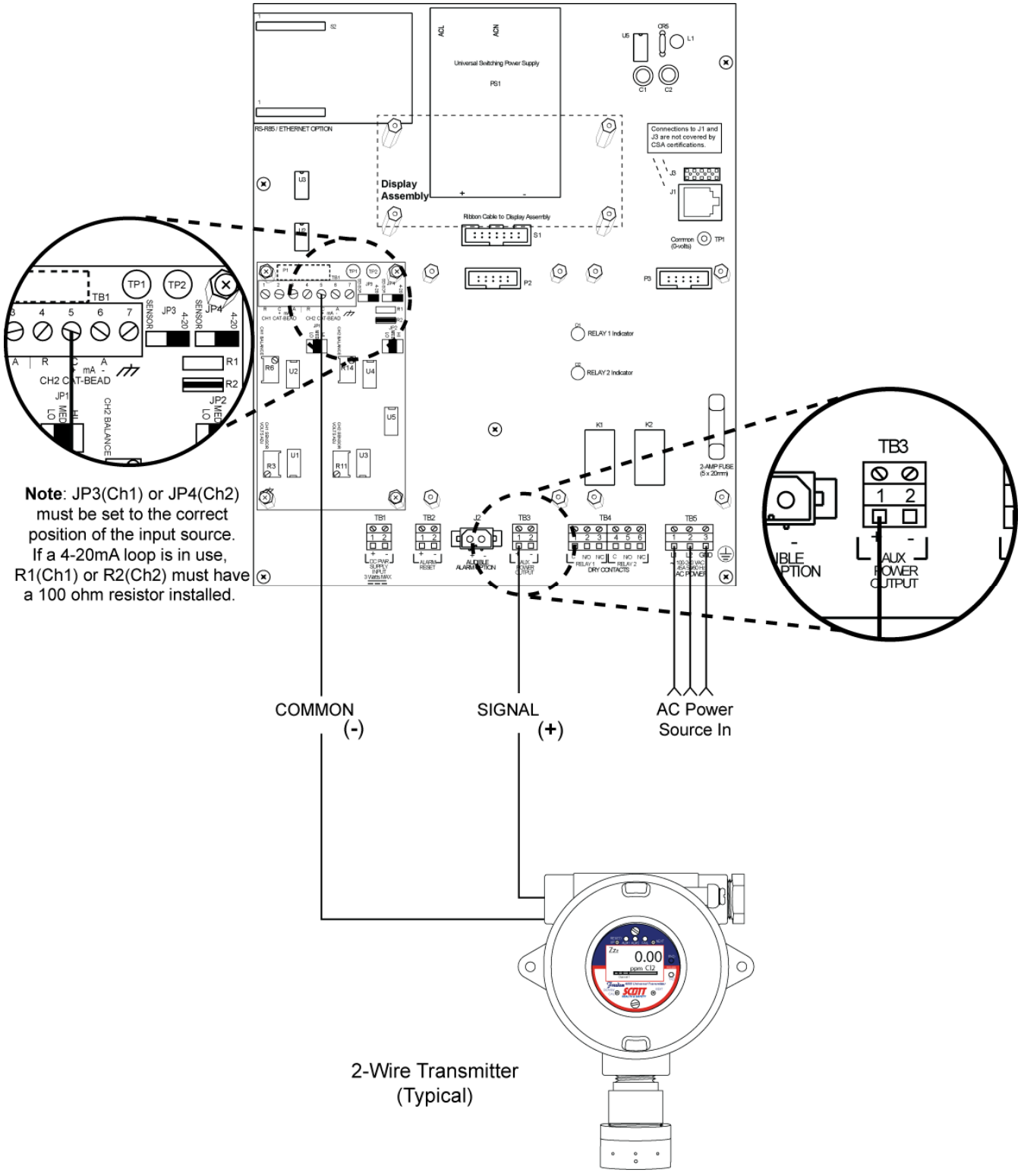


Figure 2-8. 2-Wire Transmitter (Typical) to Bridge Sensor Input PCB

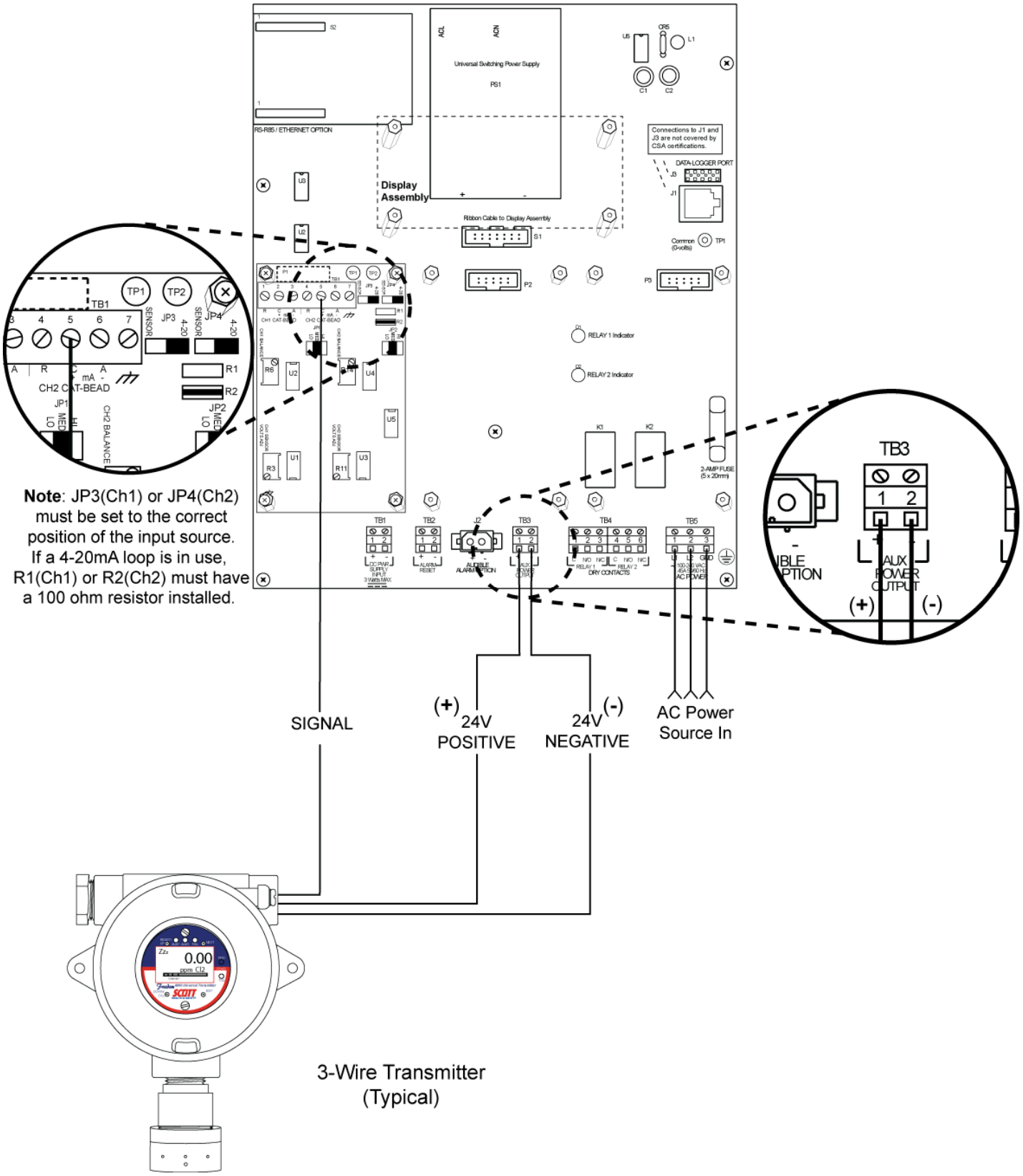


Figure 2-9. 3-Wire Transmitter (Typical) to Bridge Sensor Input PCB

P/N 087-0039 Rev E / Aug, 09

2.1.4. 4-20 mA Analog Output

The Dual Channel 4-20 mA Analog Output PCB (P/N 093-0436) option may be installed at P2 on the Motherboard.

Refer to Figure 2-10.

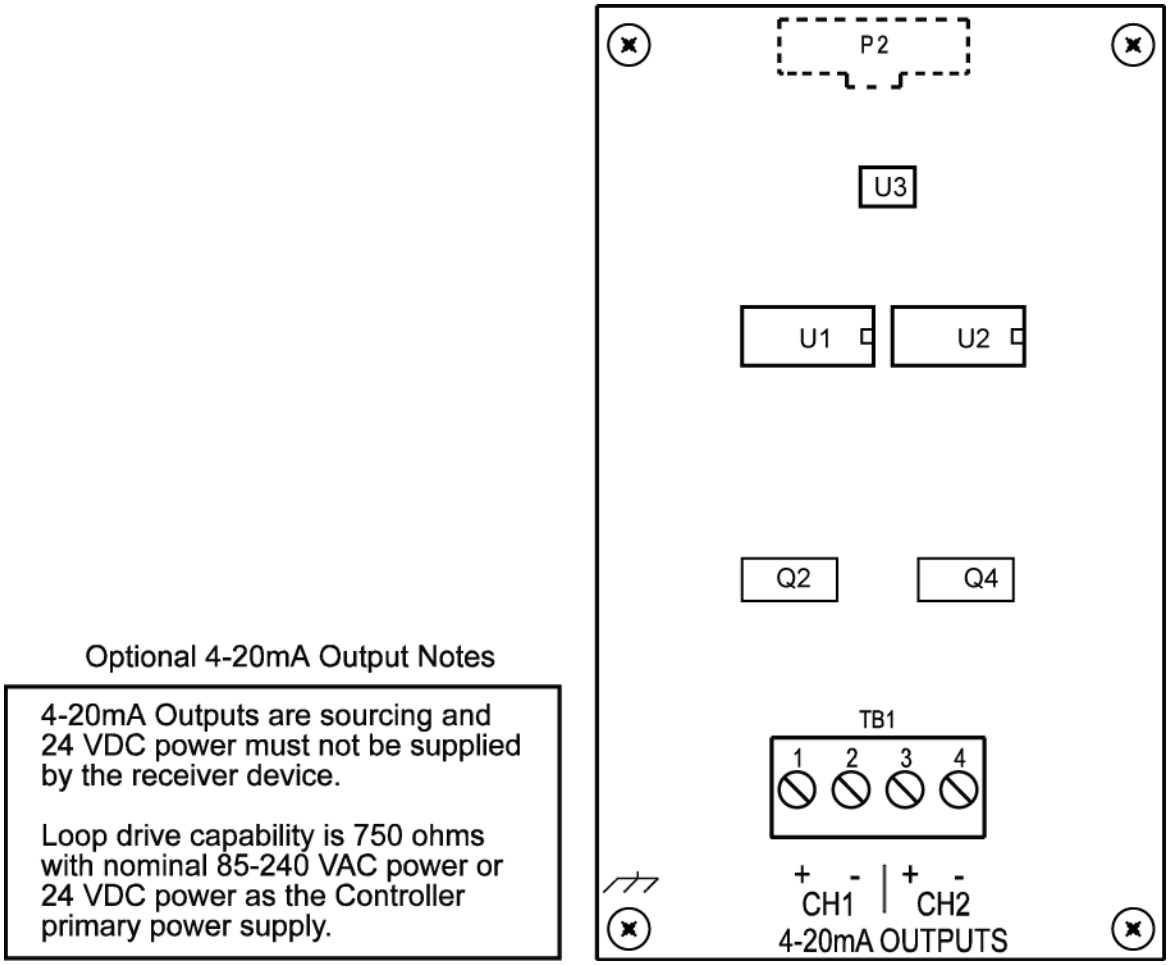


Figure 2-10. 4-20mA Analog Output PCB

Each channel output will transmit 4mA for 0% readings and 20mA for 100% readings. If the 7200 Plus primary power is 100 – 240 VAC, 4-20mA outputs are capable of driving 20mA through a 750 ohm load. Outputs are self powered and DC power should not be provided by the receiving device.

Precision calibration of the 4-20mA output DAC (digital to analog converter) is accomplished via the **Diagnostics** menu. Refer to Paragraph 4.4.1.4 for more details.

2.1.5. Discrete Relay Option

The Discrete Relay PCB (P/N 093-0435) option may be installed at P3 on the Motherboard.

CAUTION

RELAYS ARE RATED FOR RESISTIVE LOADS. INDUCTIVE LOADS, SUCH AS CONTACTOR COILS OR MOTORS MAY CAUSE CONTACT ARCING, WHICH EMITS RFI INTO THE SENSOR SIGNALS. USE APPROPRIATE SNUBBERS AND MOV'S ACROSS INDUCTIVE LOADS AND KEEP WIRING AWAY FROM SIGNAL WIRES. FAILURE TO DO SO COULD RESULT IN RFI AND NEGATIVELY EFFECT EQUIPMENT PERFORMANCE.

Refer to Figure 2-11.

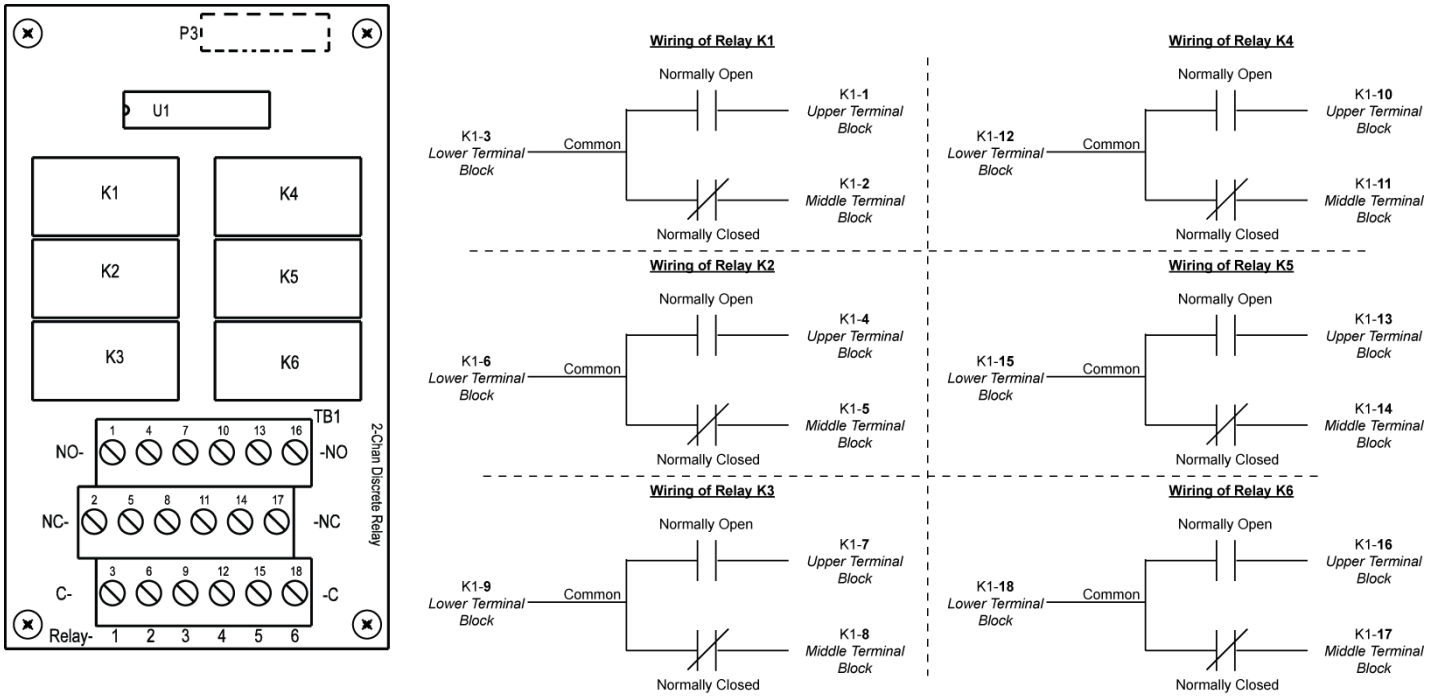


Figure 2-11. Discrete Relay PCB

This optional PCB adds six 5 amp form C relays. Relays K1, K2, and K3 are for Channel 1. Relays K4, K5, and K6 are for Channel 2. Table 2-1 shows the relationship of the Optional relays with respect to the integrated alarms and motherboard relays of the 7200 Plus. Optional relays will mirror the integrated alarms in that activation of an alarm will trip an installed optional relay as shown in Table 2-1.

Motherboard relays K1 and K2 must not be confused with the optional relays. Motherboard relays are programmable as described in Paragraph 4.4.1.1 to activate based on a user specified combination of activated alarms.

Table 2-1. Configurable Relay Matrix

Alarms	Optional Relays	Motherboard Relays
Channel 1 Alarm 1 (Ch1A1)	K1	K1 (*As Programmed)*
Channel 1 Alarm 1 (Ch1A2)	K2	K1 (*As Programmed)*
Channel 1 Alarm 1 (Ch1A3)	K3	K1 (*As Programmed)*
Channel 2 Alarm 1 (Ch2A1)	K4	K2 (*As Programmed)*
Channel 2 Alarm 2 (Ch2A2)	K5	K2 (*As Programmed)*
Channel 2 Alarm 3 (Ch2A3)	K6	K2 (*As Programmed)*

2.1.6. MODBUS RS-232/RS-485 Interface Option

The MODBUS option PCB (P/N 093-0438) adds both RS-232 and RS-485 MODBUS RTU slave ports.

NOTE

FOLLOW CORRECT IEEE RS-232 AND RS-485 INSTALLATION GUIDELINES WHEN USING THE MODBUS INTERFACE OPTION.

Refer to Figure 2-12.

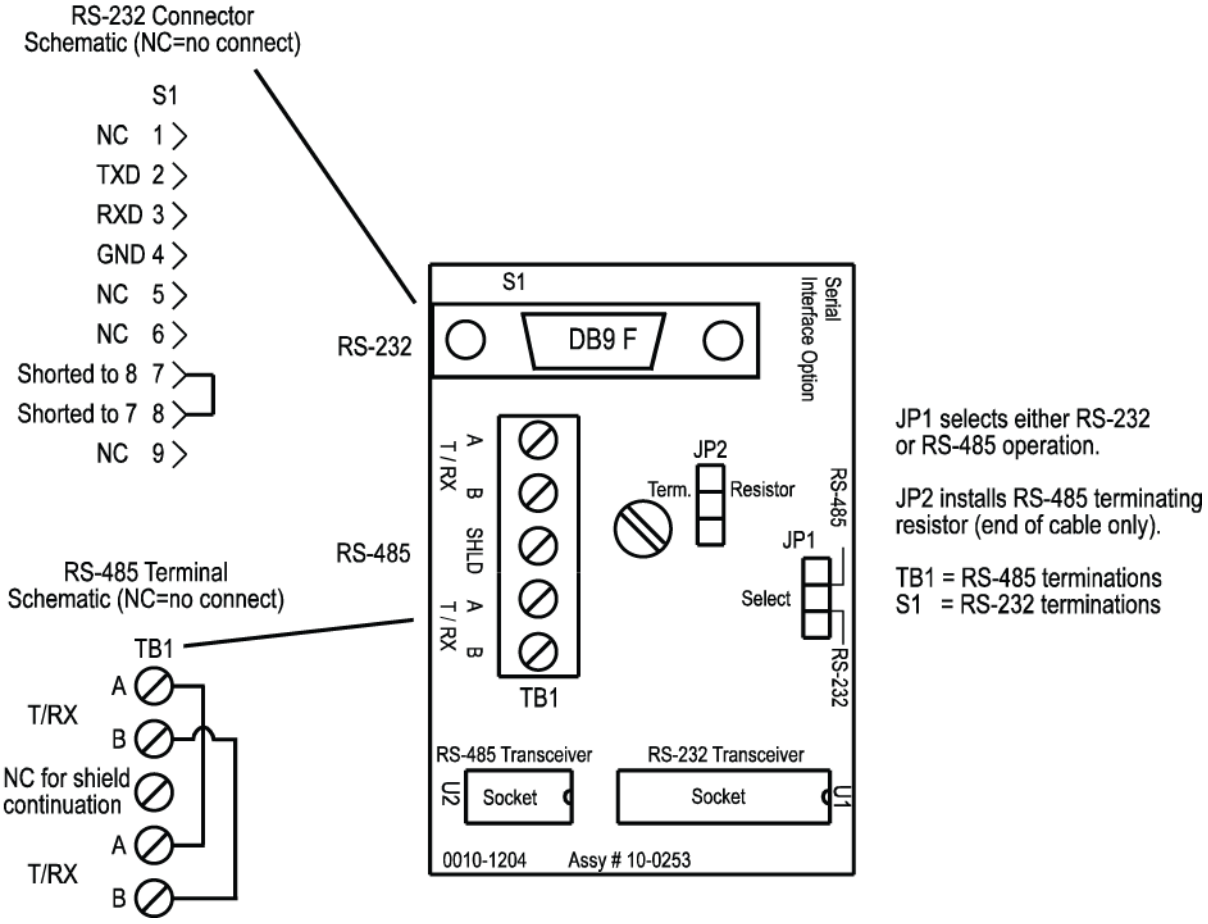


Figure 2-12. MODBUS Interface PCB

This optional PCB mounts to connectors on the upper left corner of the 7200 Plus Motherboard. TB1 provides two pairs of T/Rx terminals and a floating terminal for shield continuation to multi-drop 7200 Plus's onto an RS-485 cable without doubling wires into the same screw terminals. RS-232 interface is made by connecting to DB9 connector S1.

Refer to the Appendix for a list of all MODBUS registers and their function codes.

2.2. Using the Keypad

Navigation of the Menus displayed on the LCD is accomplished using the **UP**, **DOWN/CAL**, **NEXT**, **EDIT**, and **ALARM RESET** magnetic keys. Press, where used in this manual, refers to activating the magnetic key with the magnetic wand.

Upon entering a menu, a pointer controlled by the **UP/DOWN** keys indicates the selected item.

YES/NO or *ON/OFF* entries toggled by pressing the **EDIT** key. Others, such as *Channel ID* and *Eunits* fields, may have many ASCII character possibilities.

Allowed ASCII characters are:
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz blank space !"#$%&`()*+,-./0123456789:;<=>?@

EDIT places a cursor under the item and **UP/DOWN** scrolls through each allowed entry. The **NEXT** key moves the cursor to the next position within a field. When the field is complete, **EDIT** clears the cursor and loads the field into non-volatile memory where it is retained indefinitely. Without a cursor present, the **NEXT** key returns to the previous menu one menu at a time and will eventually return the LCD to the data display.

ALARM RESET notifies the 7200 Plus that the user acknowledges an alarm and when pressed will deactivate any optional audible alarms. Flashing indicators will change from flashing to a steady state.

2.3. Specifications

Supply Voltage:	10-30VDC (Alternate), 3 Watts max or 100-240VAC (Primary), 50/60Hz, 0.45 amp max, 20 Watts steady state
Power Consumption:	Minimum: 1.5 Watts @ 10-30VDC
	Maximum: 12 Watts @ 24VDC
Temperature Range:	-25 to 50 °C (-13 to 122 °F)
Humidity Range:	0 to 90% R.H. Non-Condensing
Altitude:	Up to 2000 Meters (6562 feet)
Housing/Installation Categories:	NEMA 4X, DIV 2 Groups A, B, C, D; Cat. II and pollution degree 3; NEMA 4x; IP66
	NEMA 7, DIV 1 Groups B, C, D; with o-ring in door to satisfy NEMA 4
Relays:	Common Form C, dry contacts (Standard)
	5 Amp for 28VDC and ~250VAC (Resistive Loads)

CAUTION

APPROPRIATE DIODE (DC LOADS) OR MOV (AC LOADS) SNUBBER DEVICES MUST BE INSTALLED WITH INDUCTIVE LOADS TO PREVENT RFI NOISE SPIKES. RELAY WIRING IS TO BE KEPT SEPARATE FROM LOW LEVEL SIGNAL WIRING. FAILURE TO DO SO COULD CAUSE FAULTY RELAY ACTIVATION.

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3. Physical Installation

3.1. Installation Considerations

3.2. Mounting the 7200 Plus

The standard 7200 Plus wall mounted unit is NEMA 4X rated. The terminal cover must be installed with the bevel on top to prevent moisture from entering the internal components. Two screws on the enclosure door must remain in place to maintain the rating of Class I, Division 2, Groups A,B,C and D or non-hazardous locations only.

Two ¾" NPFT fittings are provided on the bottom side of the unit to route electrical connections and connect conduit. Conduit runs should not be weight bearing. Use provided mounting holes to wall mount the 7200 Plus.

Refer to Figure 3-1.

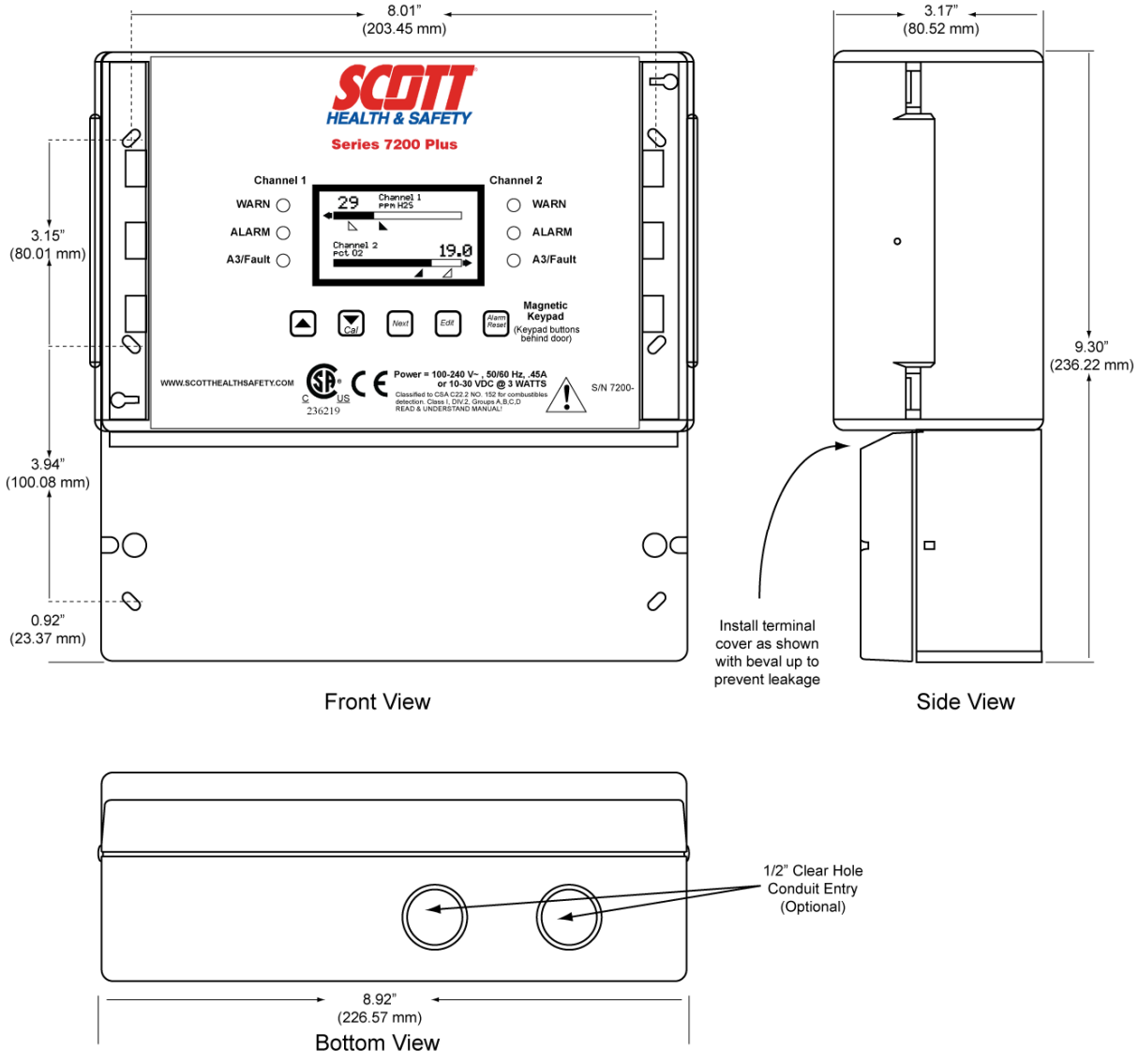

Figure 3-1. Mounting Dimensions

3.2.1. Optional NEMA 7 Explosion Proof Enclosure

The NEMA 7 wall mount enclosure is an optional aluminum case for mounting the 7200 Plus in potentially hazardous environments. It is rated for DIV 1 & 2; Groups B,C,D.

Refer to Figure 3-2.

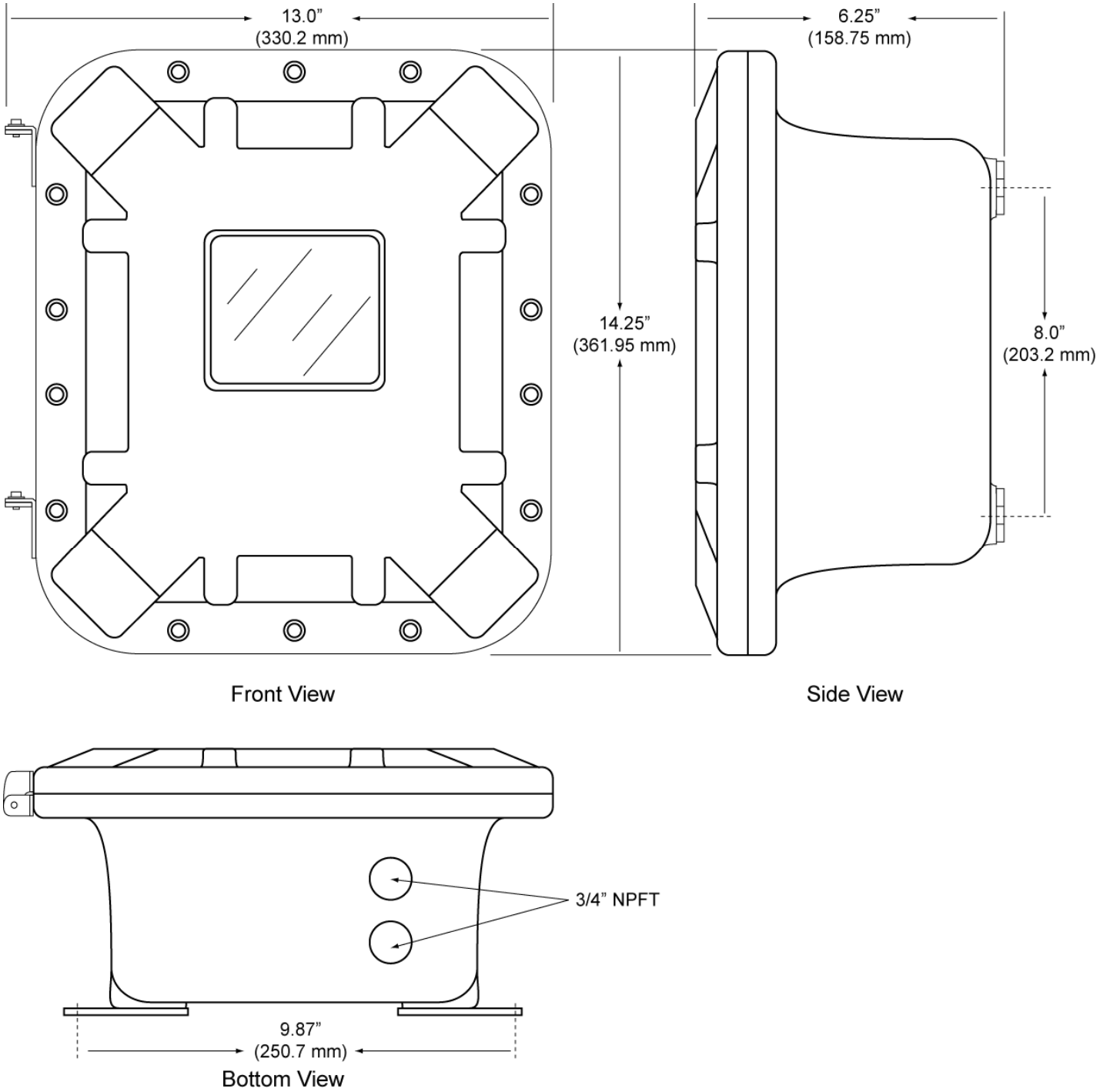

Figure 3-2. NEMA 7 Enclosure

3.3. Electrical Configurations

3.3.1. Electrical Codes

To meet prevailing electrical codes, use conduit and all other materials required for electrical wiring in hazardous areas. Install wiring according to National Electrical Code (NEC) Articles 501-517.

WARNING

NON-METALLIC ENCLOSURES ARE NOT GROUNDED BY METAL CONDUIT. TO GROUND INTERNAL COMPONENTS, A PROPER EARTH GROUND MUST BE CONNECTED TO TB5-GND TERMINAL. FAILURE TO DO SO CAN CAUSE ELECTRICAL GROUNDS AND DAMAGE ELECTRONIC COMPONENTS, OR RISK OF ELECTRICAL SHOCK.

WARNING

NON-METALLIC ENCLOSURE DOES NOT PROVIDE GROUNDING BETWEEN CONDUIT CONNECTIONS. USE GROUNDING TYPE BUSHINGS AND JUMPER WIRES. ALL FIELD WIRING MUST HAVE INSULATION SUITABLE FOR AT LEAST 250V. FAILURE TO DO SO CAN CAUSE ELECTRICAL GROUNDS AND DAMAGE ELECTRONIC COMPONENTS, OR RISK OF ELECTRICAL SHOCK.

3.3.2. Optional External Power Supply

Some applications require 24VDC power in excess of the 12 watts supplied by the 7200 Plus. NEC Class 2 50W external supplies are available for Division 1 (part # 093-0469) and Division 2 (part # 093-0468) potentially hazardous area installations and both also include a NEMA 4X weather rating.

For more information, contact Scott H & S.

3.4. Evaluating Wire Length and Size

The minimum AWG wire size that can be used to connect the power supply to the transmitter is determined by the output voltage of the power supply, the maximum current drawn by the transmitter, and the voltage drop that occurs across the wiring.

When choosing the location of the transmitter and its power supply, the size and length of the power supply wires become an issue if the wiring's voltage drop would cause the transmitter's input voltage to drop below its minimum operating voltage.

The distance 4-20 mA signals can travel is dependent upon several factors including the cable gauge, DC power supply voltage level and impedance of the input of the receiving device. Assuming a nominal 24 VDC power supply if powered by the 7200 Plus, maximum total loop resistance is 750 ohms in a 3-wire mode.

NOTE

SCOTT HEALTH & SAFETY CONTROLLERS HAVE AN INPUT RESISTANCE OF 100 OHMS.

The maximum signal-loop resistance that can be connected to a transmitter's output is 800 ohms @ 24 VDC (400 ohms @ 12 VDC). In almost all cases, the wire size chosen for the power supply leads will be more than adequate for the 4–20 mA signal lead. For example, an 18 AWG wire provides a 4–20 mA signal lead wiring distance of approximately 34,000 feet.

NOTE

MAXIMUM SIGNAL-LOOP RESISTANCE IS DEFINED AS THE SUM OF THE 4–20 MA SIGNAL-WIRE RESISTANCE, THE RECEIVER'S INPUT RESISTANCE (NORMALLY 250 OHMS), AND THE RESISTANCE OF THE COMMON GROUND WIRE BETWEEN THE TRANSMITTER AND POWER SUPPLY.

3.5. Sensor Head Wiring

Each 5.5V Sensor Head is supplied with 6" of wire for direct mounting to the transmitter housing. Each 6V Sensor Head is supplied with 18" of wire, allowing it to be mounted on the transmitter housing either directly, or by a short section of ¾" conduit. Both types of Sensor Heads can have a three conductor cable spliced to the attached wiring for increased distances between the 7200 Plus and the Sensor Head location.

The wiring attached to the Sensor Head is already sealed and requires no additional sealing to conform to NEC requirements for explosion-proof installations, as long as the detector head is mounted no further than 18" from the transmitter [NEC Article 501-5(a)(1)].

Table 3-1 shows the maximum distances 6V (Gold Bell) Sensor Heads may be separated using a three-conductor cable with various wire gauges.

NOTE

THE 5.5V (SCOTT HEAD) DRAWS FAR LESS CURRENT ALLOWING FOR MUCH GREATER LENGTHS OF WIRE. FOR EXAMPLE, USING 18 AWG, THE MAXIMUM DISTANCE IS 1600 FEET (488M).

The added detector-head wiring must meet prevailing electrical codes for hazardous-area installations that specify conduit sealing, explosion-proof fittings, and special wiring methods.

NOTE

THE DETECTOR HEAD'S SAFETY-GROUND WIRE MUST THE SAME SIZE AS THE OTHER TRANSMITTER WIRES.

Table 3-1. Maximum Distance Between 6V Sensor Head and 7200 Plus

6V Sensor Head (Gold Bell)		
AWG	Ohms/Foot @ 85°C (185°F)	Maximum Distance
12	0.0023	106' (32m)
14	0.0031	80' (24m)
16	0.0059	42' (13m)
18	0.0080	31' (9m)

When installing conduit and wiring from the Sensor Head to the 7200 Plus, adhere to the following:

- If the Sensor Head is mounted more than 18" from the 7200 Plus, encase all wire splices in a junction box. Place conduit seals, Crouse-Hinds EYS 216 (or equivalent), between the 7200 Plus and the junction box.
- Use AMP (or equivalent) parallel or butt type splices for all wire connections.
- Ground the junction box.
- Trim any excess wire and connect the detector head's black, white, and red wires to terminal block TB1 terminals R, C, and A on the Cat Bead Input PCB as shown in Figure 3-3.

3.6. Cat Bead Sensor Initial Setup

Each channel must be configured to match the sensor with which it will operate. This procedure must be performed at the time of install on each new bridge sensor.

1) Prior to connecting remote sensors, apply power to the system.
2) Remove the 7200 Plus terminal cover.

WARNING

LIVE VOLTAGE IS PRESENT. TAKE APPROPRIATE ELECTRICAL SAFETY PRECAUTIONS TO PREVENT THE RISK OF ELECTRICAL SHOCK. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OF DEATH.

3) Measure the voltage between each channel's A and R terminals and set the *Voltage Adjust* potentiometers for the correct sensor excitation voltage.

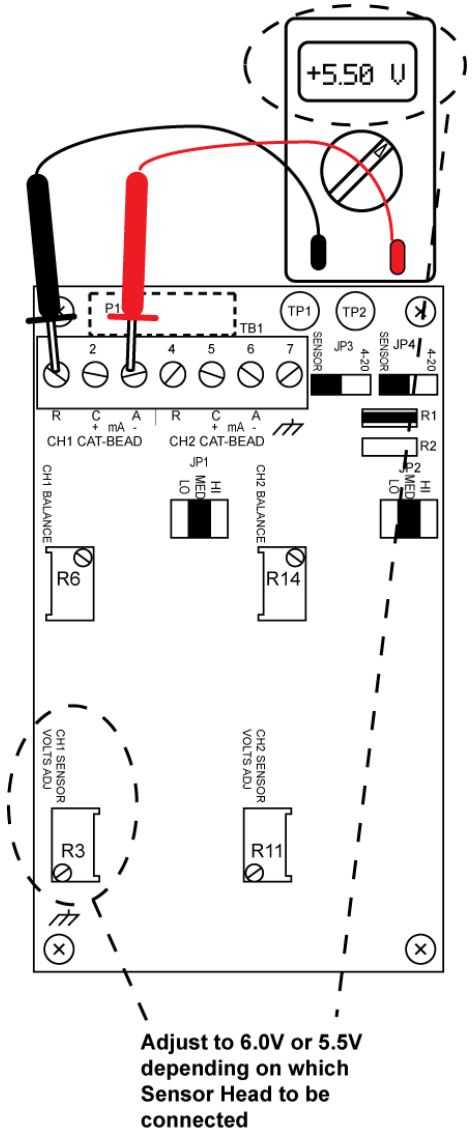

Figure 3-3. Sensor Voltage Adjustment

CAUTION

SENSORS MAY BE DAMAGED BY OVER VOLTAGE CONDITIONS. SCOTT H & S RECOMMEND THE VOLTAGE ADJUST POTENTIOMETER SCREWS BE COVERED BY A DOLLOP OF RTV OR SIMILAR MATERIAL AFTER COMPLETION OF THIS PROCEDURE. OVERVOLTAGE MAY CAUSE DAMAGE TO SENSORS.

4) Remove system power and connect sensor wires to the A-C-R terminals as shown in Figure 3-3 depending on system configuration.

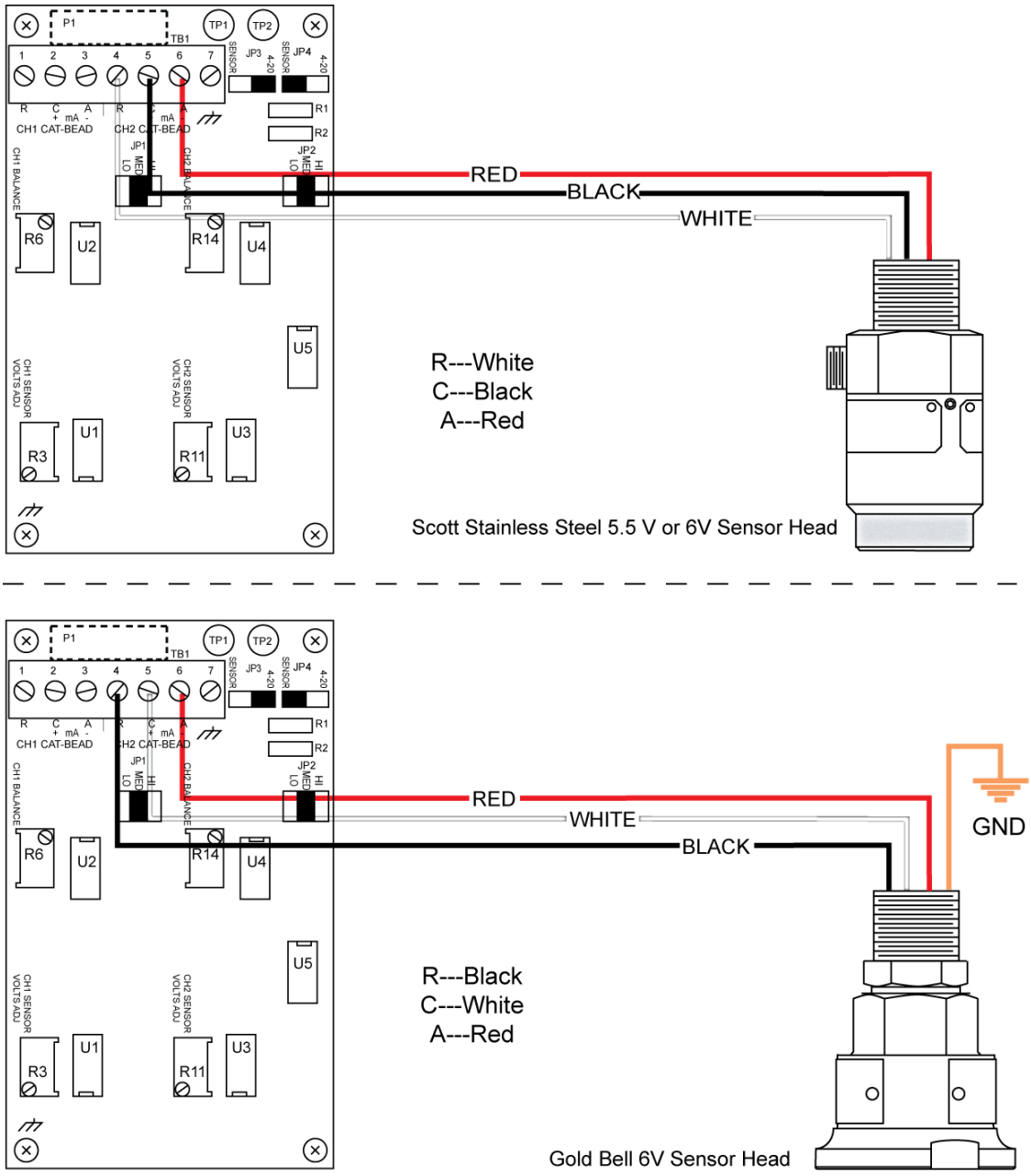

Figure 3-4. Cat Bead Sensor Wiring to Bridge Sensor Input PCB

P/N 087-0039 Rev E / Aug, 09

5) Reapply system power and confirm correct voltage across each sensor's A & R terminals.

NOTE

IF SENSOR HEAD IS REMOTE AND ADDITIONAL WIRE LENGTH HAS BEEN ADDED, IT WILL BE NECESSARY TO MEASURE THE EXCITATION VOLTAGE AT THE SENSOR HEAD TO COMPENSATE FOR I * R VOLTAGE LOSSES IN THE WIRING.

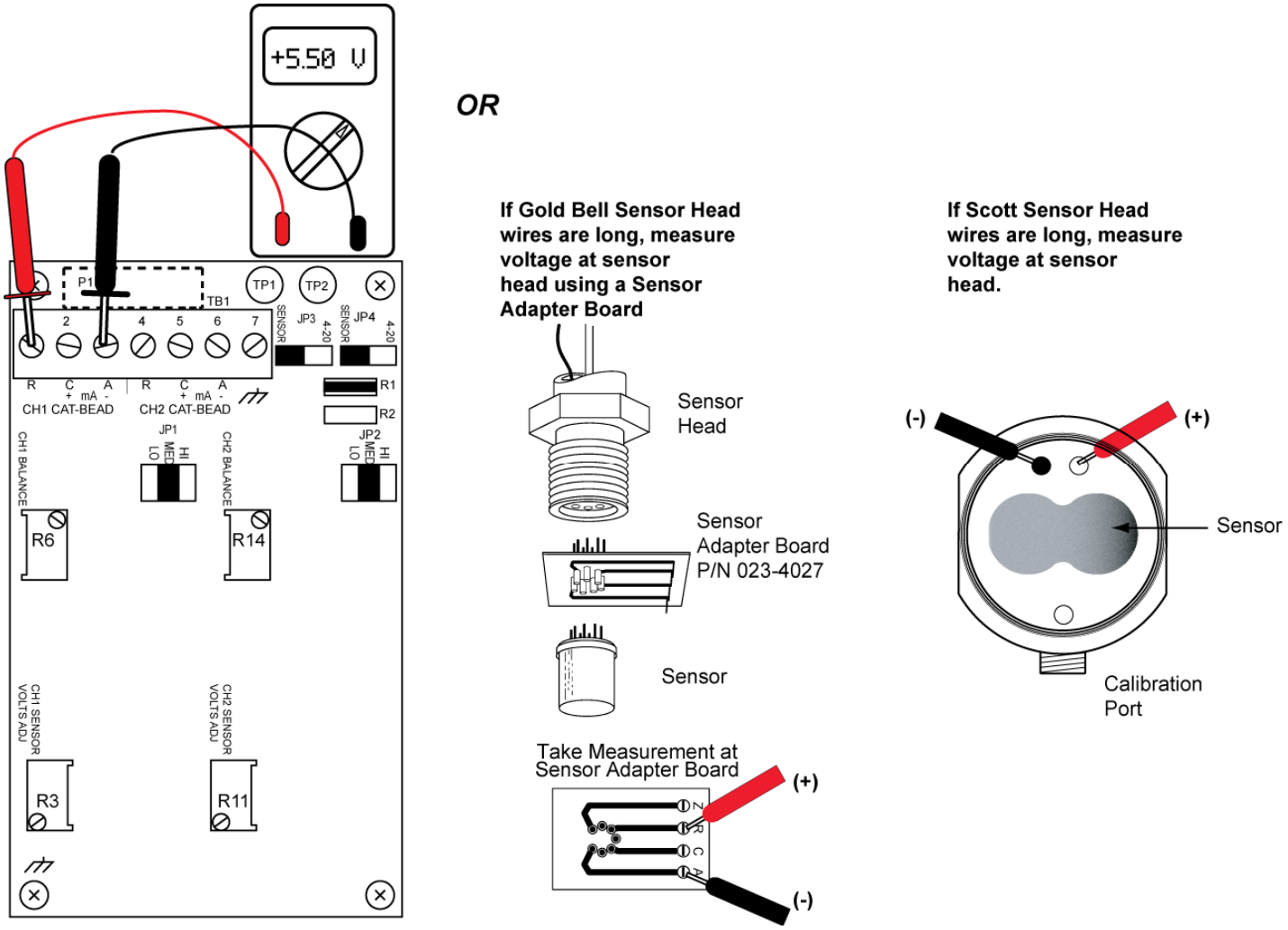

Figure 3-5. Sensor Voltage Measurement

6) With the voltmeter's negative lead on the A (-) terminal of the channel being tested, connect the positive lead to TP1 (Ch1) or TP2 (Ch2).

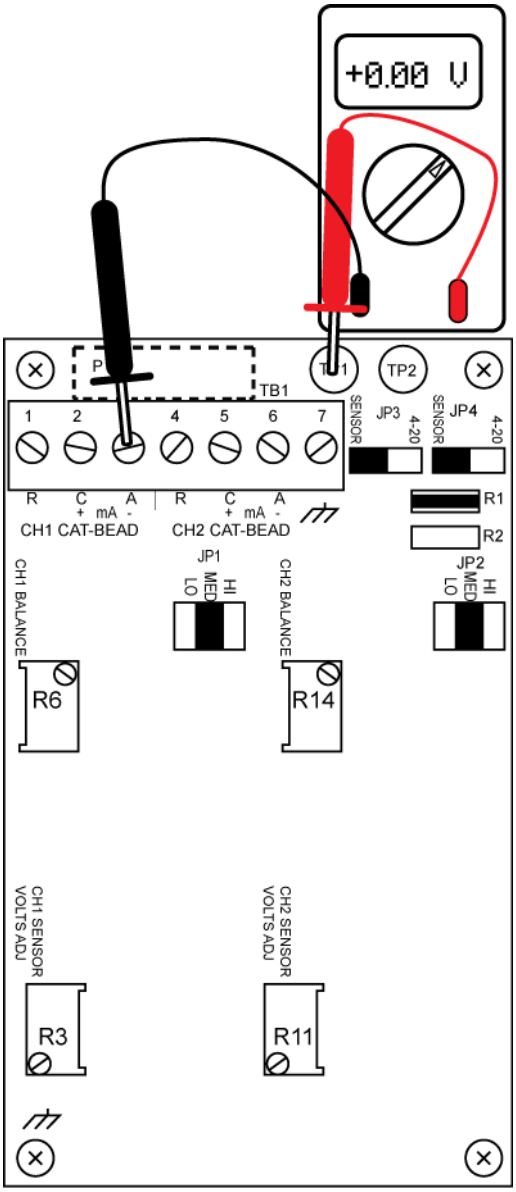

Figure 3-6. Voltage Measurement

7) With zero air on that sensor, adjust the *Balance* potentiometer for .4 volts at the test point.

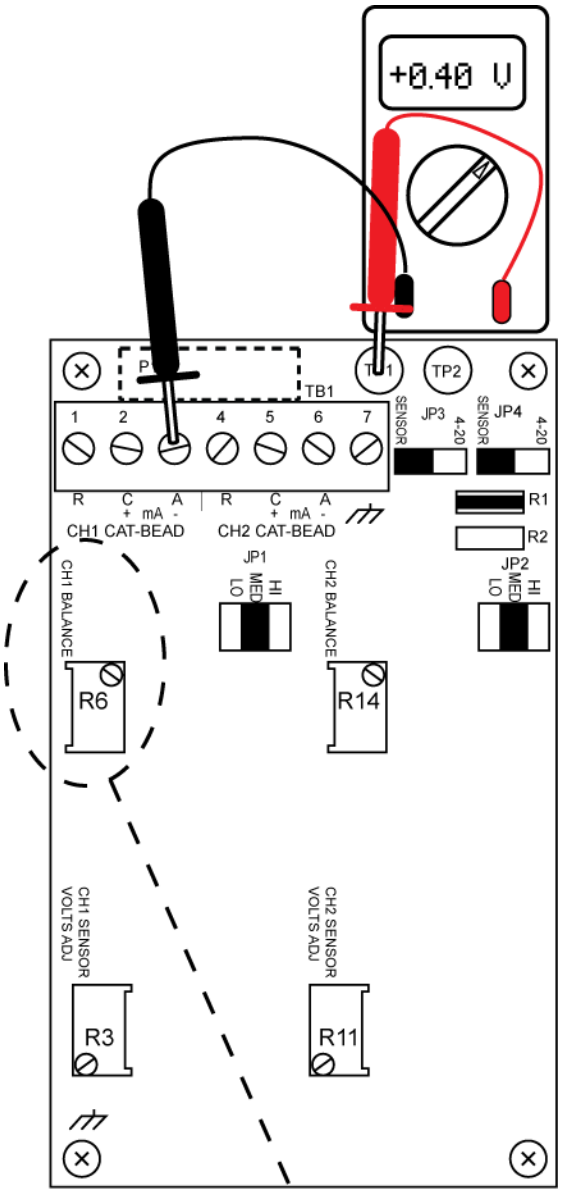

Figure 3-7. Balance Adjustment

P/N 087-0039 Rev E / Aug, 09

8) Apply 50% span gas to the sensor and allow the test point voltage to stabilize. Two volts = 100% input to the A – D Converter and .4 volts = 0%. Therefore, 1.2 volts = 50%. Place the 3-position *Coarse Gain* jumper into the position which reads between .9 volts and 1.2 volts on the test point with 50% gas on the sensor. Gain settings for each jumper position are as follows: no jumper = 1, right = 7, middle = 21, left = 41. Multiple jumpers have an additive affect upon gain, so the right and middle jumpers together provide a gain of 28.

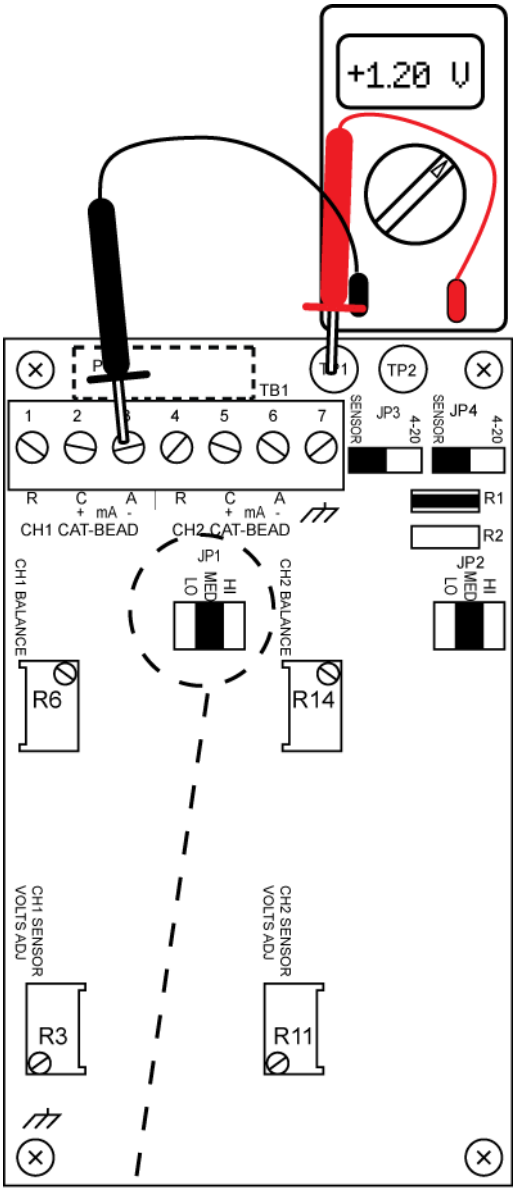

Figure 3-8. Coarse Gain Jumper Setting

Further calibration of this sensor now requires only typical calibration as described in Paragraph 3.7.

3.7. Calibration

Calibration from the 7200 Plus should normally be performed on sensors only. Typical calibration of remote transmitters should occur at the transmitter.

WARNING

OPERATING A DETECTOR THAT HAS EXCEEDED ITS CALIBRATION DATE CAN CAUSE FALSE READINGS OF DETECTED GASES. READINGS OBTAINED WHILE UNIT IS OUT OF CALIBRATION ARE INVALID AND COULD LEAD TO DEATH OR INJURY.

WARNING

LOCAL ALARMS ARE INHIBITED IN THE 7200 PLUS WHILE IN CALIBRATION MODE. VERIFY THE ENVIRONMENT IS CLEAN AND FREE OF HAZARDOUS GASES AND TOXINS OR HAVE MONITORING PERFORMED BY ANOTHER UNIT PRIOR TO CALIBRATING. FAILURE TO DO SO COULD LEAD TO INJURY OR DEATH

CAUTION

THE CALIBRATION MODE IN THE 7200 PLUS SHOULD ONLY BE USED WHEN LOCAL CALIBRATION OF A MONITORING IS NOT POSSIBLE. CALIBRATING AN INPUT SIGNAL AT MORE THAN ONE LOCATION WILL CAUSE INACCURATE READINGS AND COULD LEAD TO INJURY OR DEATH.

Scott Health & Safety recognizes the potential of the 7200 Plus and remote monitors as a life saving device when operated and maintained correctly. As such, verifying proper operation of the 7200 Plus and remote monitors in the form of Span calibration is essential to ensure the 7200 Plus and remote monitors perform as intended in a potentially hazardous environment.

The frequency at which Span calibration occurs is best determined based on local regulatory standards, company policies, and industry best practices. Scott Health & Safety is not responsible for setting policies or practices.

Calibration of the 7200 Plus and remote monitors occurs in two stages. Zero calibration is performed to establish baseline readings of atmospheres that are known to be free of toxic or combustible gases. Span calibration is performed to ensure the monitor detects target gases within specified operating parameters.

Span calibration is the adjustment of the 7200 Plus and remote monitors response to match a known concentration of gas. Sensors can lose sensitivity through normal degradation, exposure to high gas concentrations, or sensor poisoning. Accurate calibration can be achieved only if specific concentrations of the correct gases are used. Span calibration should be performed when a new sensor is installed.

Scott Health & Safety recommends a daily Zero calibration be performed prior to each day's use and when the monitor displays a reading other than its baseline reading in an atmosphere known to be free of any toxic or combustible gases. When an atmosphere is not known to be free of toxic or combustible gases, a Zero Air calibration cylinder may be used.

Optional 4-20mA outputs (if equipped) transmit 1.5mA during CAL MODE and 4mA during the subsequent CAL DELAY to prevent external alarms during calibration.

Follow these 7200 PLUS sensor calibration guidelines:

- Calibration from the 7200 Plus should normally be performed on sensors only. Typical calibration of remote transmitters should occur at the transmitter.
- Calibration accuracy is only as good as the calibration standard accuracy. Scott H & S recommends calibration standards with NIST (National Institute of Standards and Technology) traceable accuracy to increase the validity of the calibration.
- Do not use a gas cylinder beyond its expiration date.
- Calibrate a new sensor before use.
- Allow the sensor to stabilize before starting calibration.
- Calibrate using zero air to ensure the highest accuracy.

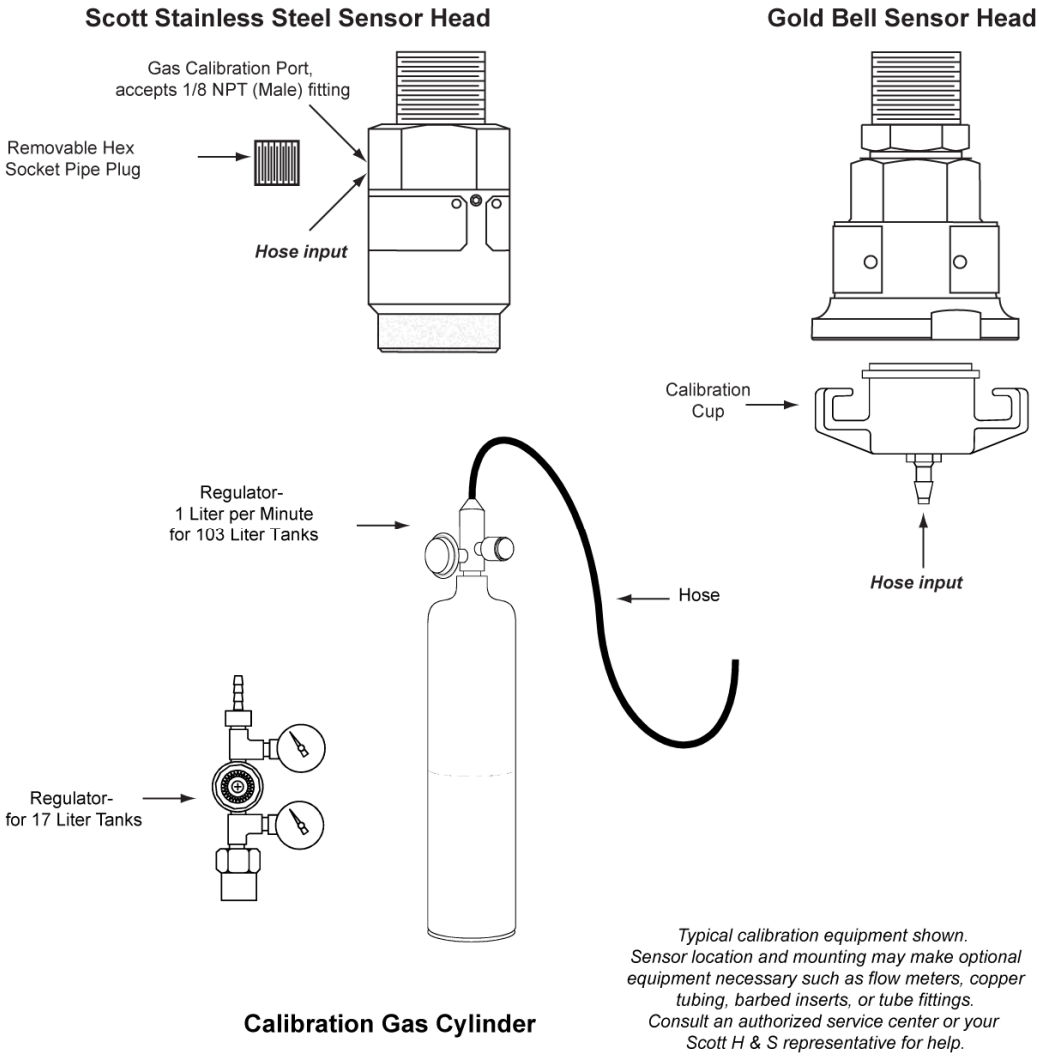

Figure 3-9. Typical Calibration Setup

P/N 087-0039 Rev E / Aug, 09

3.7.1. Determining Span Gas to Use

Typical calibrations are performed using methane gas as the Span Gas. For accurate readings of other types of gas, the Span Gas must match the gas to be measured. However, to calibrate a sensor for detection of other gases, a surrogate gas, propane, can be used. Appendix B details how to apply a K-factor to the propane surrogate gas to obtain detection of other gas types.

3.7.2. Sensor Calibration Procedure

To perform a calibration from the 7200 Plus, perform the following:

NOTE

CAL MODE AUTOMATICALLY EXITS IF NO KEYS ARE ACTIVATED AFTER 5 MINUTES.

1) To enter Cal Mode from any data display, press the **DOWN / CAL** key then use the **UP/DOWN** keys to select the channel to calibrate.
2) Apply Zero gas to the sensor to be calibrated with an appropriate Zero calibration standard. Wait approximately five minutes or until readings are stable at the LCD display, then press the **EDIT** key to perform the Zero calibration.
3) If the Zero calibration is successful, Cal Mode automatically proceeds to the Span check.
4) Apply Span gas to the sensor to be calibrated that matches the selected value set in the Cal Setup Menu. Wait approximately five minutes or until readings are stable at the LCD display, then press the **EDIT** key to perform the Span calibration.

NOTE

REFER TO PARAGRAPH 4.3.3 FOR INFORMATION ON SETTING OR VERIFYING THE SPAN GAS VALUE.

5) If the Span calibration is successful, the display flashes REMOVE CAL GAS and starts the Cal Delay.
6) CAL MODE will be complete after the end of the CAL DELAY.

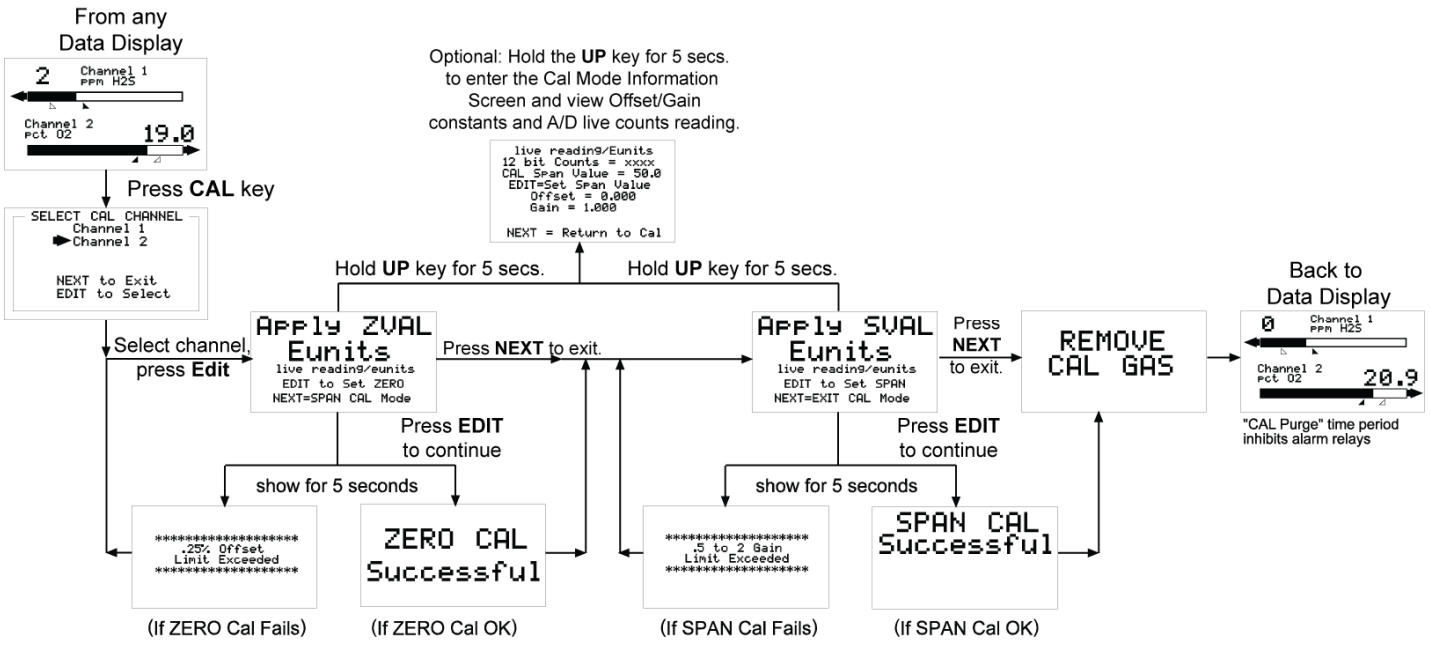

Figure 3-10. Calibration Quick Guide

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4. Operation

4.1. Menu Structure

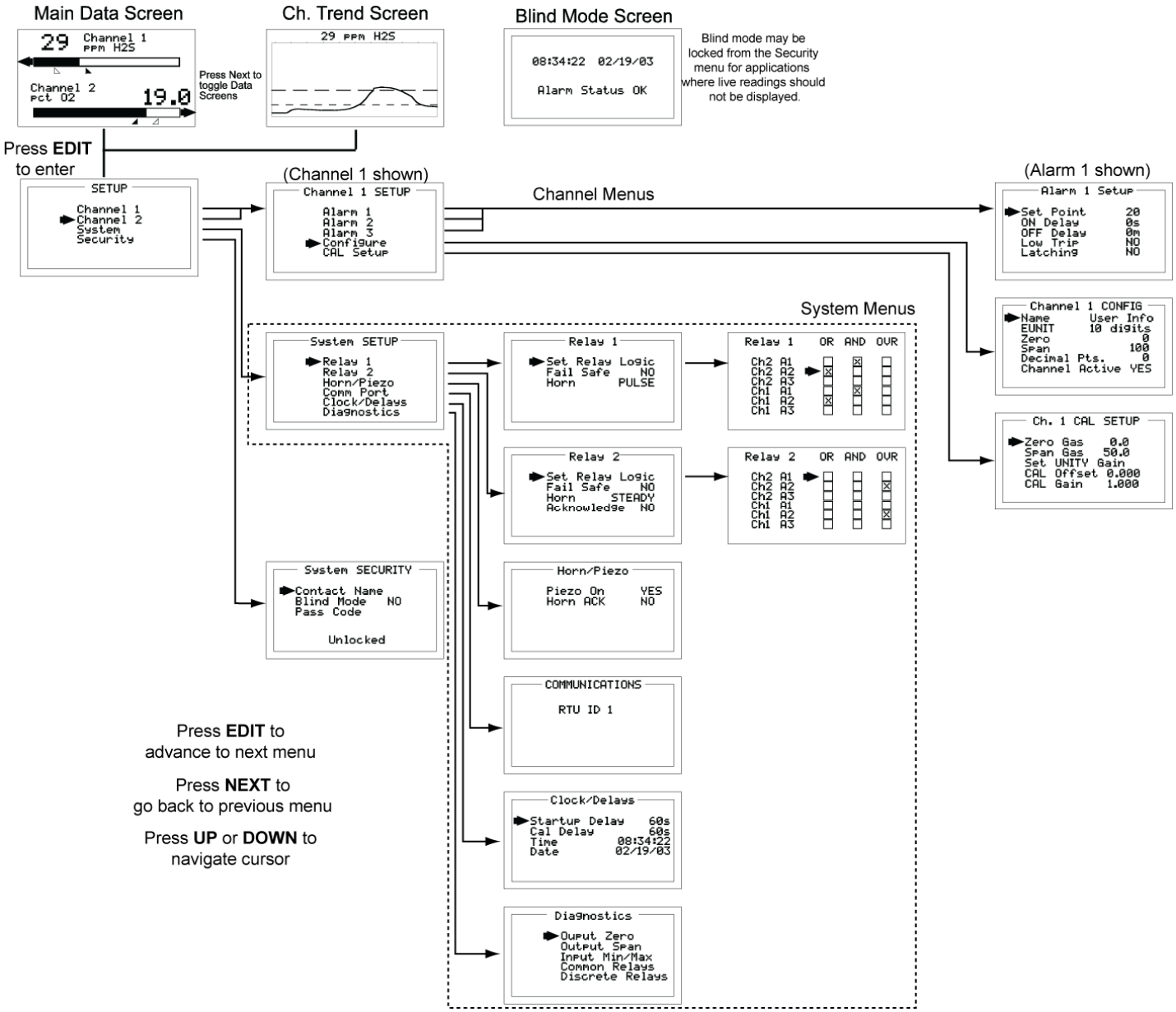


Figure 4-1. Menu Structure of the 7200 Plus

4.2. Data Display Screens

The primary source of operator interface with the 7200 Plus is through the LCD Display. Data can be monitored using any one of three screens. Select the **NEXT** key to cycle between Data Displays screens.

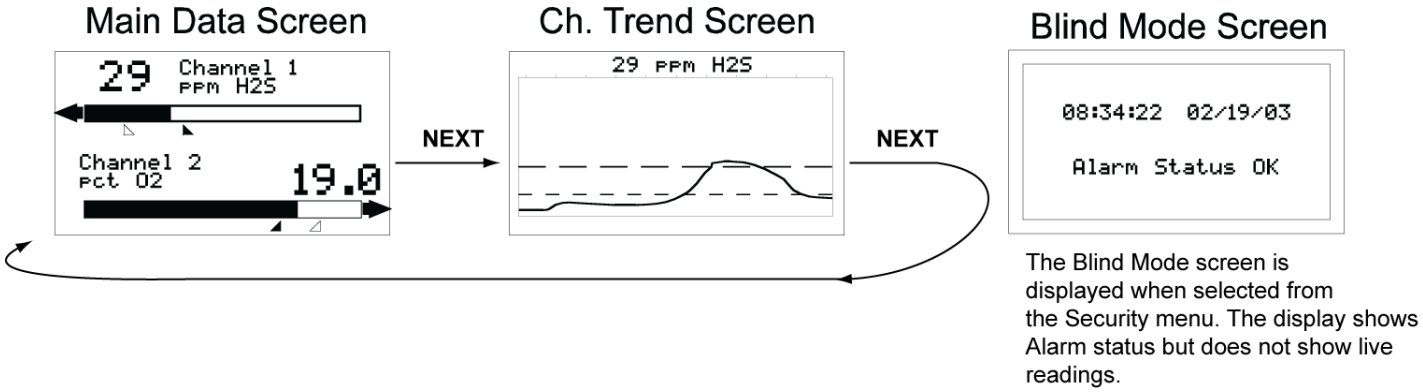


Figure 4-2. Data Display Screens

4.2.1. Main Data Screen

The Main Data screen simultaneously displays information from both channels at once. Values are shown with their Eunits tag as well as with a bar graph. Arrows below the bars indicate alarm trip point values, making it easy to identify channels at or near alarm. The direction of the horizontal 45 degree arrow side points indicates either a HIGH or LOW trip. Left and right hand arrows located at the ends of each bar graph point towards the associated Channel Alarm LED's on the front panel.

Refer to Figure 4-2.

4.2.2. Channel Trend Screen

The Trend screen displays information from a single channel at one time. 30 minutes of data is displayed in a graphical line charted against alarm set points. Alarm set points are shown with dashed lines representing A1, A2, and A3. Viewing of different channels is accomplished by activating the **NEXT** key.

Refer to Figure 4-2.

4.2.3. Blind Mode Screen

The 7200 PLUS Blind Mode screen does not allow viewing of channel engineering unit values. It only indicates the system's alarm status and time / date. Some applications require only alarm status be displayed and prefer monitored values not be shown. A Security menu option allows locking all configuration parameters and having only the Blind Mode screen available for viewing.

Refer to Figure 4-2.

4.3. Channel Setup Menus

Both of the two monitored channels are customized using the menus for each individual channel as shown in Figure 4-3. From any of the Data Display screens, press **EDIT** to enter the Setup Menu. The firmware revision of the 7200 Plus is displayed to the right of Setup. Each channel has three customizable alarms and can be configured and calibrated individually from the other channel.

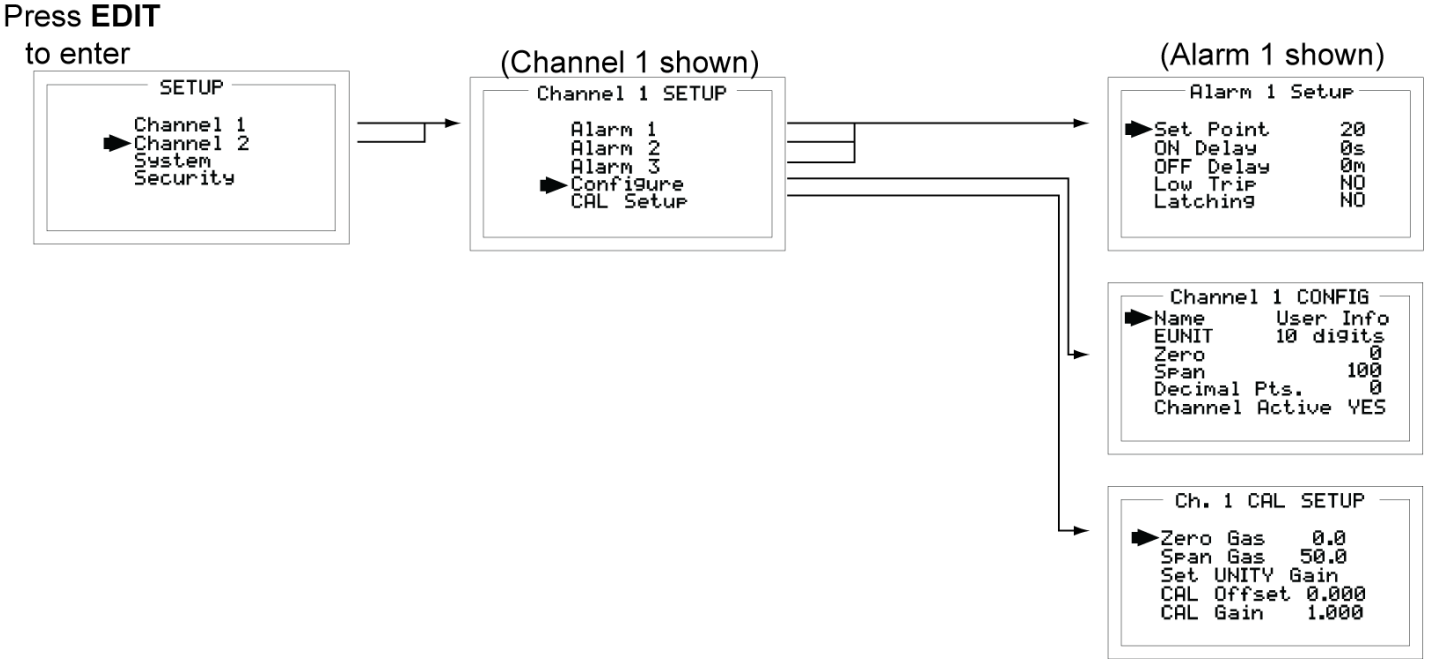


Figure 4-3. Channel Setup Menu

P/N 087-0039 Rev E / Aug, 09

4.3.1. Alarm Setup Menu

Alarms 1, 2 and 3 have identical menus. Typical applications often have A1 set at a WARN level, A2 at a HIGH level and A3 at a negative FAULT level. However, it is important to understand there is no functional difference between A1, A2, and A3. Since their configuration menus are identical, only one is shown in Figure 4-3.

- **Set Point** is entered in engineering units and determines the value where the alarm trips. For example, if a channel monitors 0-50 ppmH2S and the desired alarm level is 10 ppm, the correct entry is 10.00. A one percent dead band prevents alarm chatter. This means after tripping an alarm the input must move at least 1% of full scale back through the set point for the alarm to auto reset.
- **ON Delay / OFF Delay** entries allow **ON** and **OFF** time delays affecting how long the trip-point must be surpassed before an alarm event transition occurs. **ON** delays are limited to 10 seconds while **OFF** delays may be as long as 120 minutes. Delays are useful in many applications to prevent nuisance alarms and unwanted cycling into and out of alarm conditions.
- **Low Trip** is set for **No** for increasing alarms or **Yes** for decreasing alarms to determine if the alarm activates upon exceeding or falling below the set point.
- **Latching** determines either manual or automatic alarm reset operation. **Yes** requires a manual **ALARM RESET** to unlatch the alarm even though an alarm condition no longer exists. **Yes** also causes this alarm's common relay, front panel LED, and optional discrete relay to latch. **NO** allows all outputs for this alarm to automatically reset after the alarm condition clears.

NOTE

LED INDICATORS ON THE FRONT PANEL ARE ALARM 1-YELLOW AND ALARM 2 AND 3-RED.

Discrete LED indicators on the front panel indicate the status of each alarm. Any new alarm event causes the associated LED to flash until an **Alarm Reset** occurs causing an acknowledged steady on condition. Operators should recognize new alarms by a flashing LED. **ALARM RESET** also acknowledges, or deactivates, audible devices driven by the Audible Alarm option connector J2.

4.3.2. Channel Config Menu

Channel Config menu allows configuration of all variables for the selected channel including Name, Eunit, Zero and Span values, number of decimal points to display, and whether the channel should be active or not.

NOTE

EACH CHANNEL MENU IS IDENTICAL AND MUST BE SET INDIVIDUALLY. OPTIONS SELECTED FOR CHANNEL 1 WILL NOT EFFECT CHANNEL 2 AND VICE VERSA.

- **Name** allows the user to give the channel a unique name, typically of the gas or toxin the channel is detecting.
- **Eunit** allows the user to give the channel a unique measurement value, for example, ppm or %.

- **Zero** and **Span** values are specified by the user to identify the range of Eunits being measured on a channel from the 4-20mA signal. For example, if a channel is measuring 0-10ppm chlorine, the Zero value should be 0.000 and the Span value 10.00.

NOTE

ZERO AND SPAN VALUES SHOULD ALWAYS BE ENTERED USING FOUR DIGITS IN THIS MENU REGARDLESS OF OPTIONAL DECIMAL POINT SETTINGS.

- **Decimal pts.** sets the number of digits to display beyond the decimal point for the channel display, limited to zero to four digits. At zero digits, a reading of 0 ppm is displayed as 0, while at 4 digits, the reading is displayed as 0.000. Conversely, a reading of 100 ppm would be displayed as 100 at zero digits and 100.0 at four digits.
- **Channel Active** is set to either yes or no depending on whether the channel is being utilized. When No is selected, alarms are inactive on that channel and a line will be drawn though the channel on the LCD display.

4.3.3. Cal Setup Menu

The Calibration Setup Menu supports push button calibration of Zero and Span values. This feature should be utilized only when there are no other zero/span controls within the monitoring system since it is inappropriate to calibrate a signal at more than one point. Therefore, if calibration will be performed at another transmitter or monitoring device, the 7200 Plus Cal Mode feature should not be used.

Options available in the Cal Setup menu include:

- **Zero Gas** allows users to set the Zero Gas value.
- **Span Gas** allows users to set the Span Gas value.
- **Set Unity Gain** resets all calibration data making Cal Offset = 0 and Cal Gain = 1.

4.4. System Configuration Menus

Several system level options are available that effect the 7200 Plus and are not channel specific are shown in Figure 4-4. These include System Setup, Security and a Diagnostic menu to test relay and analog I/O without stimulating inputs.

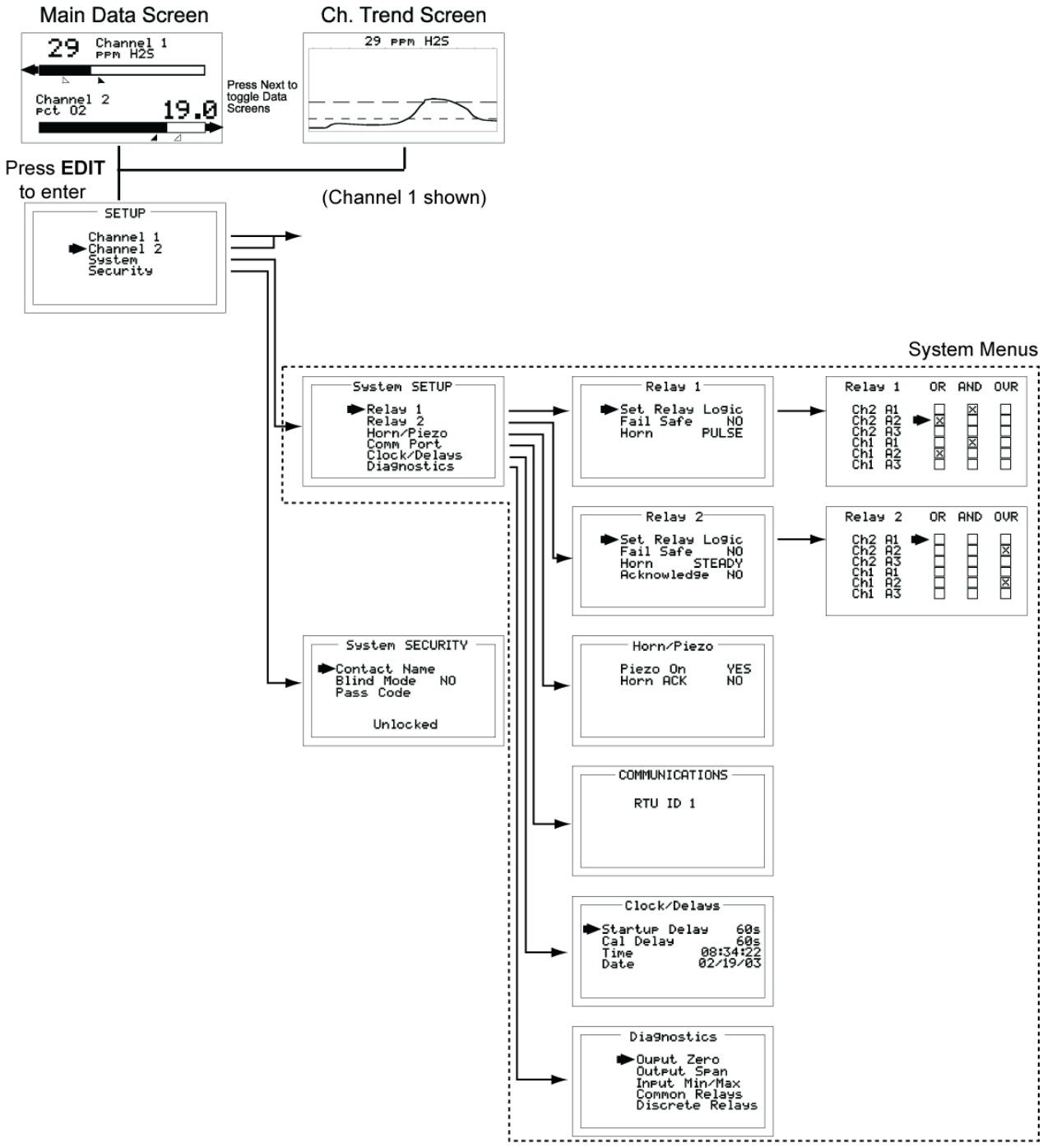


Figure 4-4. System Configuration Menus

P/N 087-0039 Rev E / Aug, 09

4.4.1. System Setup Menu

The System Setup menu allows the user to navigate to further system options affecting all channels, setting up relays, setting a remote ID, and diagnostics.

Setting the Remote ID allows setting an RTU address for the optional slave MODBUS serial port. This slave port may be used to transfer 7200 Plus data to a host device such as a PC, PLC, DCS or even other Scott Health & Safety Controllers such as the Sentinel 16 Controller. The slave port is addressable, allowing many 7200 Plus controllers to connect to a single RS-485 cable.

Refer to Figure 4-4.

4.4.1.1. Relay Setup and Relay Logic Menus

Relay 1 and Relay 2 setup and logic menus are identical except that the Relay 2 setup menu has an acknowledge feature for control of an audible device. All other Relay 1 & Relay 2 features are identical and are described only once.

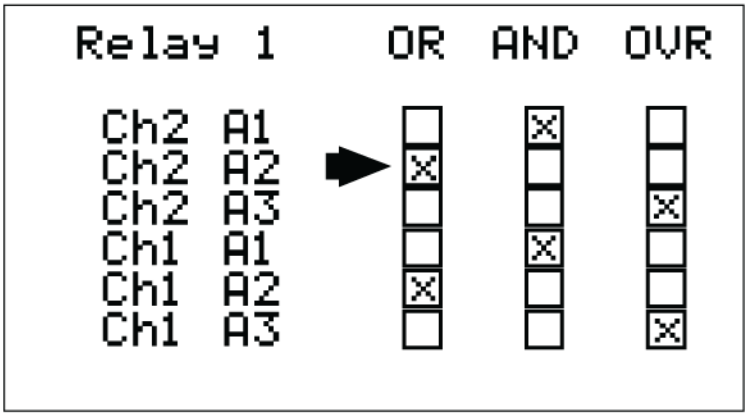
- **Set Relay Logic** opens the Relay Logic Menu. Each relay can be configured to activate based upon a combination of alarms. Users may opt to have any of the three alarms for the two channels or any combination of those alarms activate the relay using selection boxes for three logic qualifiers
  - **OR** conditions mean that a situation where any of the **OR** checked alarms occurring will activate the relay. **OR**, when selected, works in combination with the checked **AND** boxes to form a combination of alarms that will activate a relay.
  - **AND** conditions mean that a situation where all of the **AND** checked alarms occurring will activate the relay. **AND**, when selected, works in combination with the checked **OR** boxes to form a combination of alarms that will activate a relay.
  - **OVR**, when selected, works independently from the **AND** & **OR** qualifiers. Any alarm with **OVR** checked will activate the relay upon occurrence of the alarm.

For the relay to activate, based on checked qualifiers, the logic formula is:

*[(The total of all **AND** checks) plus (any of the **OR** checks)] or (any single **OVR** check)*

Refer to Figure 4-5.

Using this example to understand Relay Logic:



*[(the total of all **AND** checks) plus (any of the **OR** checks)] or (any single **OVR** check)*

For Relay 1 to activate with the logic populated in the Figure, the following would have to occur:

- Ch2A1 and Ch1A1 must both be active with either Ch2A2 or Ch1A1 active
  *[(the total of all **AND** checks) plus (any of the **OR** checks)]*

or

- Ch2A3 active
  *(any single **OVR** check)*

or

- Ch1A3 active
  *(any single **OVR** check)*

Figure 4-5. Relay Logic Setup

- **Fail Safe** controls relay activation for the common relays. Failsafe On causes these relays to de-energize during alarm conditions and energize when there is no alarm. With Failsafe active, a power failure forces the relay contact to the alarm position.
- **Horn** controls how activating this relay will affect the horn driver circuit connected to J2 on the motherboard. Choices are No, Steady, or Pulse. Warning level alarms might be set to pulse the horn with high alarms set for steady. Personnel then know which alarm level is present by hearing the pulsing or steady horn.
- **Acknowledge ON** (not allowed on Relay 1) allows Relay 2 to be deactivated during alarm conditions by selecting the **ALARM RESET** key on the front panel. This is useful if another audible device is being driven by the relay. The acknowledge feature is not available for Relay 1 since it is often used for driving a warning light and Relay 2 for driving a horn. It could be dangerous if an operator acknowledged the horn AND the light since no indication of the high alarm condition remains.

4.4.1.2. Horn/Piezo Menu

The 7200 Plus Display PCB is equipped with a small audible piezo that chirps when keys are pressed providing an audible feedback to the operator. The piezo also may be set to audibly indicate alarm conditions by entering YES into the Piezo On menu item. This piezo will then mimic the Horn settings in the Relay Setup menus. Refer to Paragraph 4.4.1.1 for more information.

Horn ACK menu item determines if the Horn Driver output may be acknowledged by an Alarm Reset. Yes causes an Alarm Reset to silence the horn even though an alarm condition remains active.

4.4.1.3. Clock/Delays Menu

The 7200 Plus monitors signals from sensors that may require varying times to stabilize after power is applied.

- **StartUp Delay** menu item allows setting how long alarm relays remain disabled after power is applied.
- **Cal Delay** determines how long alarm relays are inhibited after completing a calibration.
- **Time** and **Date** are for setting the correct time and date. The 7200 Plus is equipped with a 24-hour clock and calendar. Time of day must be entered in 24 hour mode. For example, 6:00:00 PM is indicated as 18:00:00.

4.4.1.4. Diagnostics Menu

WARNING

LOCAL ALARMS ARE INHIBITED IN THE 7200 PLUS WHILE IN DIAGNOSTICS MODE. VERIFY THE ENVIRONMENT IS CLEAN AND FREE OF HAZARDOUS GASES AND TOXINS OR HAVE A MONITORING PERFORMED BY ANOTHER UNIT PRIOR TO ENTERING DIAGNOSTICS. FAILURE TO DO SO COULD LEAD TO INJURY OR DEATH.

The Diagnostics menu is useful for testing standard and optional Input / Output devices such as relays and 4-20mA outputs.

- **Output Zero / Output Span** DAC value (digital to analog converter) menu items are set at the factory to calibrate optional 4-20mA Output boards. If field adjustment is required, monitor the 4-20mA output and set the **Output Zero** DAC value for 4mA on each channel then set the **Output Span** DAC value for 20mA on each channel. These menu items may also be used to drive 4-20mA into receiver devices without stimulating sensor inputs.
- **Input Min / Max** ADC (analog to digital converter) menu items are set at the factory with default values for each channel of 200 to 1000 counts. These settings may be utilized to affect what input values provide ZERO and SPAN readouts. For example, if an application required 8mA input to read ZERO at 400 counts, an **Input Min** setting of 400 would accomplish this.
- **Common Relays** menu item allows manual activation of the common relays and optional local audible piezo.
- **Discrete Relays** menu item allows manual activation of the optional Discrete Relay boards.

4.4.2. System Security Menu

A 4-digit Pass Code entered and confirmed in this menu item locks all menus. Viewing menus is not denied, but attempts to edit variables flashes the Locked message on the LCD.

Authorized individuals locking the system should first enter a name, phone number, or other contact information into the 12 character field on the top line of the Security screen. To lock or unlock the system the correct 4 digit authorization number must be entered into the Pass Code field.

NOTE

GIVE CAREFUL CONSIDERATION BEFORE LOCKING THE 7200 PLUS MENUS. IF THE 4 DIGIT PASS CODE IS LOST, FORGOTTEN, OR OTHERWISE UNAVAILABLE, THE FACTORY MUST BE CONSULTED.

5. Parts List and Maintenance

5.1. Parts List

Table 5-1. Parts List

Part Description	Scott P/N
7200 Plus in NEMA 4X Enclosure	093-0431
7200 Plus in NEMA 7 Enclosure	093-0432
Dual Channel 4-20mA Input	093-0433
Dual Bridge Sensor Input	093-0434
Discrete Alarm Relay Board (6, 5A Form C Relays)	093-0435
Dual 4-20 mA Output	093-0436
10-baseT Ethernet with MODBUS TCP Protocol	093-0437
RS-232 / RS-485 MODBUS RTU Addressable Interface	093-0438
100db Piezo Audible Alarm	093-0439
Fuse, 2 AMP	093-0445
Motherboard Assembly PCB	093-0446

5.1.1. Scott Repairs

For quick and effective service of your instrumentation, and to reduce time spent on repairs, the SCOTT Instruments Service Department requires a Return Maintenance Authorization number be issued prior to any product being shipped for service repairs.

Contact the Service Department at:

Phone: 1- 800-247-7257 • Fax: 1-704-291-8330

Monday - Friday

8.30 AM to 5.00 PM EST.

e-mail: techsupport.scotths.us@tycoint.com

www.scotthealthsafety.com

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Appendix A - MODBUS Register and Function Code Summary

Table A-1. MODBUS Register and Function Code Summary

Variable Code	Alias	Read Function Code	Write Function
Read/Write Coils			
Alarm Ack/Reset	2001	1	5
NOTE *AFTER WRITING A TRUE TO THIS REGISTER, THE 7200 PLUS AUTOMATICALLY RETURNS IT TO FALSE.*			
Read Only Discretes			
Chan 1 Alarm 1	12001	2	N/A
Chan 1 Alarm 2	12002	2	N/A
Chan 1 Alarm 3/FLT	12003	2	N/A
Chan 2 Alarm 1	12004	2	N/A
Chan 2 Alarm 2	12005	2	N/A
Chan 2 Alarm 3/FLT	12006	2	N/A
Relay 1	12007	2	N/A
Relay 2	12008	2	N/A
Read Only Registers			
A2D Raw Chan 1	31001	4	N/A
A2D Raw Chan 2	31002	4	N/A
10 bit value representing the A2D value of 0 to 1023 for -25% to 103% Full Scale (197 = 0% & 1003 = 100%)			
D2A Chan 1	31003	4	N/A
D2A Chan 2	31004	4	N/A
10 bit value representing the D2A value of 0 to 1023 after all cal features are applied.			

Table A-1. MODBUS Register and Function Code Summary

Variable Code	Alias	Read Function Code	Write Function
Chan 1 Status	31005	4	N/A
Chan 2 Status	31006	4	N/A
(16 bit status words; bit assignment for each channel) ALARM1_BELOW BIT0 ALARM2_BELOW BIT1 ALARM3_BELOW BIT2 ALARM1_LATCH BIT3 ALARM2_LATCH BIT4 ALARM3_LATCH BIT5 ALARM3_ACTIVE BIT6 CHANNEL_DISABLED BIT7 CHANNEL_CAL BIT8			
System Status Word	31007	4	N/A
(16 bit status word; bit assignment for system status) PIEZO_DRIVE BIT6 HORN_ACK BIT7 K1_HORN_DRIVE BIT8 K2_HORN_DRIVE BIT9 K1_HORN_PULSE BIT10 K2_HORN_PULSE BIT11 K1_FAILSAFE BIT12 K2_FAILSAFE BIT13 K2_ACK BIT14 LOCK BIT15			
Alarm Status Word	31008	4	N/A
(16 bit status word; bit assignment for system status) CHAN1 ALARM1 BIT0 CHAN1 ALARM2 BIT1 CHAN1 ALARM3 BIT2 CHAN2 ALARM1 BIT3 CHAN2 ALARM2 BIT4 CHAN2 ALARM3 BIT5 RELAY_1 BIT6 RElAY_2 BIT7			

Table A-1. MODBUS Register and Function Code Summary

Variable Code	Alias	Read Function Code	Write Function
Memory Floating Point			
NOTE ***RETURNED AS 15 BIT 2S COMPLEMENT WITH +-5% OVER/UNDERAGE APPLIED. THEREFORE, THIS MUST BE CONSIDERED WHEN SCALING VALUES TO BE DISPLAYED AT THE WORKSTATION. THE FOLLOWING EQUATION MAY BE USED TO DETERMINE A VALUE FOR DISPLAY:*** $DisplayValue = \frac{MODBUSValue[(SpanValue - ZeroValue)1.1]}{32767} + \{ZeroValue - [(SpanValue - ZeroValue)0.05]\}$			
FP Value Chan 1	33001	4	N/A
FP Value Chan 2	33002	4	N/A
Memory Reals:			
NOTE ***41001-41040 REAL REPRESENTS FLOAT VALUE WITHOUT THE DECIMAL POINT SUCH THAT 123.4 IS RETURNED AS 1234. DECIMAL DIVISOR IS RETURNED AS 1, 10, 100, OR 1000 FOR DECIMAL POSITION OF 1, 2, 3, OR 4, WHERE 123.4 WOULD RETURN THE DEVISOR VALUE OF 10.***			
Chan 1 Zero Real	41001	3	N/A
Chan 1 Zero Divisor	41002	3	N/A
Chan 1 Span Real	41003	3	N/A
Chan 1 Span Divisor	41004	3	N/A
Chan 1 Alarm 1 Real	41005	3	N/A
Chan 1 Alarm 1 Divisor	41006	3	N/A
Chan 1 Alarm 2 Real	41007	3	N/A
Chan 1 Alarm 2 Divisor	41008	3	N/A
Chan 1 Alarm 3 Real	41009	3	N/A
Chan 1 Alarm 3 Divisor	41010	3	N/A

Table A-1. MODBUS Register and Function Code Summary

Variable Code	Alias	Read Function Code	Write Function
Chan 2 Zero Real	41011	3	N/A
Chan 2 Zero Divisor	41012	3	N/A
Chan 2 Span Real	41013	3	N/A
Chan 2 Span Divisor	41014	3	N/A
Chan 2 Alarm 1 Real	41015	3	N/A
Chan 2 Alarm 1 Divisor	41016	3	N/A
Chan 2 Alarm 2 Real	41017	3	N/A
Chan 2 Alarm 2 Divisor	41018	3	N/A
Chan 2 Alarm 3 Real	41019	3	N/A
Chan 2 Alarm 3 Divisor	41020	3	N/A
Binary Cal Data			
Chan 1 A2D MIN	41021	3	N/A
Chan 1 A2D MAX	41022	3	N/A
Chan 1 D2A MIN	41023	3	N/A
Chan 1 D2A MAX	41024	3	N/A
Chan 2 A2D MIN	41025	3	N/A
Chan 2 A2D MAX	41026	3	N/A
Chan 2 D2A MIN	41027	3	N/A
Chan 2 D2A MAX	41028	3	N/A
Min and Max calibration points for the D/A and A/D converters.			
Memory ASCII Strings			
User Info Chan 1	40401-40405	3	N/A
User Info Chan 2	40406-40410	3	N/A

Table A-1. MODBUS Register and Function Code Summary

Variable Code	Alias	Read Function Code	Write Function
10 ASCII characters (2 per register) assigned to the unit identifier as bytes.			
EUNITS Chan 1	40411-40415	3	N/A
EUNITS Chan 2	40416-40420	3	N/A
10 ASCII characters (2 per register) assigned to the engineering units as read bytes.			
Chan 1 ASCII Reading	40421-40423	3	N/A
Chan 2 ASCII Reading	40424-40426	3	N/A
6 ASCII characters (2 per register) reflecting the display readout.			
Firmware Version			
Version	40427-40428	3	N/A
4 ASCII characters (2 per register) reflecting the firmware version.			

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Appendix B – Multiplying K-Factors

Multiplying K-factors can be used to simulate response to a combustible in terms of a readily available compressed calibration gas such as propane-in-air. These conversion factors are calculated estimates only. They are intended to serve as a guide to show approximate typical response of a sensor to the particular gas needed for calibration.

Table B-1 and B-2 display K-Factors of gases relative to propane calibration. For measurements critical to determining a health or explosive/flammable hazard, a sensor should always be calibrated using the specific gas or vapor to be measured. There is no other way to ensure reliable readings. Too many parameters are involved to make any single, simple conversion factor accurate.

WARNING

FOR MAXIMUM SAFETY IN DETERMINING EXISTENCE OF AN EXPLOSIVE, FLAMMABLE, OR HEALTH HAZARD, YOUR PARTICULAR INSTRUMENT SHOULD BE CALIBRATED USING THE SPECIFIC GAS/VAPOR TO BE MEASURED. IF YOUR INSTRUMENT HAS AN AGENCY APPROVED CERTIFICATION (E.G. FACTORY MUTUAL, CSA, ETC.), FAILURE TO CALIBRATE ON THE SPECIFIC GAS HAZARD TO BE MONITORED MAY VOID THE CERTIFICATION. THE RESULTS OBTAINED WHEN USING THE K-FACTORS ARE APPROXIMATE AND MUST NOT BE INTERPRETED AS REPRESENTING HIGHLY ACCURATE LEL PERCENTAGES. MULTIPLYING K-FACTORS IS ADEQUATE FOR GENERAL DETECTION OF COMBUSTIBLE GASES, BUT ARE NOT ADEQUATE FOR ACCURATE GAS ANALYSIS.

WHEN IN DOUBT AS TO THE APPROPRIATE CALIBRATION GAS TO USE OR PROCEDURE, CONSULT SCOTT H & S OR AN AUTHORIZED SERVICE CENTER.

The multiplying K-factors in Table B-1 may be used to calibrate a 6.0V Gold Bell sensor head, with propane when gases other than propane are to be detected. The multiplying K-factors in Table B-2 may be used to calibrate a Scott Stainless Steel sensor head, with propane when gases other than propane are to be detected.

6.0V Example - Using Scott Health & Safety's standard Propane gas cylinder, P/N 077-0241 (42.9% LEL), to calibrate a 6.0V sensor for Hexane, multiply 42.9% LEL Propane by the Hexane multiplying K-factor of 1.7, as given in Table B-1, to obtain 73% LEL Hexane. Adjust the 7200 Plus span gas value to 73% LEL as described in Paragraph 4.3.3 before beginning calibration.

5.5V Example - Using 1% Propane (45% LEL) gas cylinder to calibrate a 5.5V sensor for Hexane, Adjust the 7200 Plus span gas value to 61% LEL as described in Paragraph 4.3.3 before beginning calibration.

Table B-1. 6V Sensor Multiplying K-Factors

Combustible Gas/Vapor	Multiplying K-Factor	Combustible Gas/Vapor	Multiplying K-Factor
Acetone (C_3H_6O)	1.3	Hydrogen (H_2)	0.8
Acetylene (C_2H_2)	1.4	Isopropyl Alcohol (C_3H_8O)	1.5
Acrylonitrile (C_3H_3N)	0.97	Methane (CH_4)	0.6
Ammonia	0.7	Methyl Alcohol (CH_4O)	1.1
Benzene (C_6H_6)	1.5	Methyl Chloride (CH_3Cl)	0.7
Butadiene (C_4H_6)	1.5	Methylene Chloride (CH_2Cl)	1.5
Butane (C_4H_{10})	1.1	Methyl Ethyl Ketone (C_4H_8O)	1.8
Cyclohexane (C_6H_{12})	1.5	Methyl Fluoride	1.1
Dichloromethane (CH_2Cl_2)	1.5	Pentane (C_3H_{12})	1.3
Note 1, 2 Dichloropropane ($C_3H_6Cl_2$)	1.5	Propane (C_3H_8)	1.0
Difluoromethane	0.9	Propylene (C_3H_6)	1.2
Ethane (C_2H_6)	0.8	Propylene Dichloride ($C_3H_6Cl_2$)	1.5
Ethyl Alcohol (C_2H_6O)	1.1	Propylene Oxide (C_3H_6O)	1.4
Ethylene (C_2H_4)	0.9	Styrene (C_8H_8)	3.95
Ethylene Oxide (C_2H_4O)	1.1	Toluene (C_7H_8)	1.7
Heptane (C_7H_{16}), JP-4, gasoline	1.9	Vinyl Chloride (C_2H_3Cl)	1.2
Hexane (C_6H_{14})	1.7	O-Xylene (C_8H_{10})	3.0

Notes: *1. Check gas readings include 10% positive correction for calibration port calibration at 2000 cc per minute.*

2. Actual calibration field checks require use of factor shown on calibration gas cylinder to correct for actual concentration variations in calibration gas lots.

Table B-2. 5.5V Sensor K-Factors

Gas/Solvent	Span Gas Value (% LEL)	Surrogate Gas	5.5V Sensor Type *P/N 40011528 (Standard)* *P/N 40012111 (Poison Resistant)*
ACETALDEHYDE	45	1% Propane (45%LEL)	40011528
ACETONE	33	½% Propane (22% LEL)	40011528
ACETONE	33	½% Propane (22% LEL)	40011528
ACRYLONITRILE	42	1% Propane (45%LEL)	40011528
ACETYLENE	48	1% Propane (45%LEL)	40011528
AMMONIA	45	1% Propane (45%LEL)	40011528
BENZENE	33	½% Propane (22% LEL)	40011528
BENZENE	50	½% Propane (22% LEL)	40012111
Note 1, 3 BUTADIENE	49	1% Propane (45%LEL)	40011528
Note 1, 3 BUTADIENE	30	½% Propane (22% LEL)	40012111
N - BUTANE	58	1% Propane (45%LEL)	40011528
ISO - BUTANE	61	1% Propane (45%LEL)	40011528
ISO-BUTYLENE	60	1% Propane (45%LEL)	40011528
BUTYL ACETATE	56	½% Propane (22% LEL)	40011528
N - BUTYL ALCOHOL	40	½% Propane (22% LEL)	40011528
CHLOROBENZENE	33	½% Propane (22% LEL)	40011528
CHLOROBENZENE	33	½% Propane (22% LEL)	40012111
CYCLOHEXANE	35	½% Propane (22% LEL)	40011528

Gas/Solvent	Span Gas Value (% LEL)	Surrogate Gas	5.5V Sensor Type *P/N 40011528 (Standard)* *P/N 40012111 (Poison Resistant)*
CYCLOHEXANONE	45	½% Propane (22% LEL)	40011528
DIMETHYL FORMAMIDE	33	½% Propane (22% LEL)	40011528
DIETHYL ETHER	35	½% Propane (22% LEL)	40011528
N - DECANE	56	½% Propane (22% LEL)	40011528
ETHANE	45	1% Propane (45%LEL)	40011528
ETHYL ACETATE	34	½% Propane (22% LEL)	40011528
ETHYL ACRYLATE	40	½% Propane (22% LEL)	40011528
ETHYL ALCOHOL	57	1% Propane (45%LEL)	40011528
ETHYL ALCOHOL	43	½% Propane (22% LEL)	40012111
ETHYL BENZENE	40	½% Propane (22% LEL)	40011528
ETHYLENE	47	1% Propane (45%LEL)	40011528
ETHYLENE OXIDE	54	1% Propane (45%LEL)	40011528
ETHYLENE OXIDE	56	1% Propane (45%LEL)	40012111
HEPTANE	36	½% Propane (22% LEL)	40011528
N - HEXANE	36	½% 61Propane (22% LEL)	40011528
N-HEXANE	56	1% Propane (45%LEL)	40012111
HEXANE	61	1% Propane (45%LEL)	40011528
ISOPROPYL ALCOHOL	65	1% Propane (45%LEL)	40011528

Gas/Solvent	Span Gas Value (% LEL)	Surrogate Gas	5.5V Sensor Type *P/N 40011528 (Standard)* *P/N 40012111 (Poison Resistant)*
METHYL ETHYL KETONE	33	½% Propane (22% LEL)	40011528
METHYL ETHYL KETONE	43	½% Propane (22% LEL)	40012111
METHYL ISO BUTYL KETONE	36	½% Propane (22% LEL)	40011528
2-PYRROLIDONE	38	½% Propane (22% LEL)	40011528
METHANOL	51	1% Propane (45%LEL)	40011528
METHANOL	51	1% Propane (45%LEL)	40012111
METHYL STYRENE	53	1% Propane (45%LEL)	40011528
MINERAL SPIRITS	62	½% Propane (22% LEL)	40011528
MONOCHLOROBENZENE	33	½% Propane (22% LEL)	40011528
NAPTHA V.M. & P.	46	½% Propane (22% LEL)	40011528
NITRO PROPANE	34	½% Propane (22% LEL)	40011528
ISO - OCTANE	40	½% Propane (22% LEL)	40011528
ISO - OCTANE	61	½% Propane (22% LEL)	40012111
N-OCTENE	56	½% Propane (22% LEL)	40011528
OCTENE	47	½% Propane (22% LEL)	40011528
PENTANE	33	½% Propane (22% LEL)	40011528
ISO - PENTANE	33	½% Propane (22% LEL)	40011528
ISOPRENE	52	1% Propane (45%LEL)	40011528

Gas/Solvent	Span Gas Value (% LEL)	Surrogate Gas	5.5V Sensor Type *P/N 40011528 (Standard)* *P/N 40012111 (Poison Resistant)*
PROPANE	49	1% Propane (45%LEL)	40011528
PROPYLENE	57	1% Propane (45%LEL)	40011528
STYRENE	43	½% Propane (22% LEL)	40011528
STYRENE	63	½% Propane (22% LEL)	40012111
TETRAHYDROFURAN	57	1% Propane (45%LEL)	40011528
TETRAHYDROFURAN	50	½% Propane (22% LEL)	40012111
TOLUENE	36	1% Propane (45%LEL)	40011528
TOLUENE	60	½% Propane (22% LEL)	40012111
VINYL ACETATE	63	½% Propane (22% LEL)	40011528
VINYL CHLORIDE	41	½% Propane (22% LEL)	40011528
O - XYLENE	46	½% Propane (22% LEL)	40011528
O - XYLENE	68	½% Propane (22% LEL)	40012111

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